SAFETY ELEMENT
OF THE
COUNTY OF SACRAMENTO
GENERAL PLAN

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County of Sacramento

Planning and Community Development Department
General and Advance Planning Section

SACRAMENTO COUNTY GENERAL PLAN
SAFETY ELEMENT

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GLOSSARY

Acre-Feet	The amount of water necessary to cover an acre one foot deep.
Design Freeboard	Distance between water level design and top of levees.
FEMA	Federal Emergency Management Agency.
FIRM	Federal Insurance Rate Map.
NFIP	National Flood Insurance Program.
Non Project Levee	Levees maintained privately or by local nonfederal agencies.
One Hundred (100) Year Event	A flood of such magnitude that it would have a one percent chance of occurring in a given year.
Project Levee	A federally maintained levee.
Rural Stream	A stream which is located outside of the Urban Services Boundary (see Land Use Element).
Urban Stream	A stream which is located within the Urban Services Boundary (see Land Use Element).
USBR	U.S. Bureau of Reclamation.
Weir	A dam built in a waterway to raise the water level or divert its flow.

SACRAMENTO COUNTY GENERAL PLAN
SAFETY ELEMENT

Section I

GOALS AND POLICIES

INTRODUCTION

The purpose of the Safety Element is to identify and assess the potential for hazards to occur in Sacramento County and to formulate measures that provide adequate public protection. Sacramento County's physical setting and the projected rate of urban expansion create a potential for the residents of the County to be greatly affected by several hazards. Hazards can result from the action of nature, as in the case of earthquakes and floods; they can be man-made, as in the case of fires caused by arson or through carelessness. They can also originate from a combination of both natural and man-made causes, such as dam failure that results from an earthquake. This element examines both natural and man-made hazards, including seismic events, flooding, and fires. Minimizing and preventing these hazards are the focus of this Element. For a discussion of airport-related safety issues, the reader is referred to the Noise Element.

Historically, Sacramento County has experienced major property losses and some loss of life due to flooding. Recent flood events have demonstrated a need to reevaluate the protection afforded the community by its existing levee system. Studies that have been prepared since the 1986 flood have shown that a substantial portion of the County is not protected from a 100-year flood event. The County, the U. S. Army Corps of Engineers (Corps), and other responsible agencies are developing plans designed to protect the area against future floods.

Sacramento County is less affected by seismic events and other geologic hazards than other portions of the state. Nevertheless, some property damage has occurred in the past. The damage that was experienced has largely been the result of major seismic events occurring in adjacent areas, especially the San Francisco Bay area and, to a lesser extent, the foothills of the Sierras. The areas of Sacramento County most vulnerable to seismic and geologic hazards are those areas subject to liquefaction, the action of expansive soils, and subsidence. Additional policies related to the preservation of urban streams as floodways are discussed in the Conservation Element, Section V, C. Urban Streams.

Fires, both urban and wildland, represent another type of hazard to which areas of the County may be exposed. Grass fires, caused by lightning, arson, or carelessness, can occur in the less developed portions of the County. Again,

Sacramento County is less vulnerable to this type of hazard than surrounding counties with sparse and/or hillside development. Structure and other types of urban fires are a threat to any community and emergency planning must account for such a possible danger. The ability of government and other responsible agencies to respond to the needs of the population that has been subject to a hazard is another concern that this element assesses. An adequate circulation network is central to saving lives and minimizing property damage. Areas of special concern are those in the Delta near levees and the floodplains of rivers and streams where the danger from flooding is the greatest.

The Safety Element does not address issues involving the storage and/or transportation of hazardous materials in relationship to land use planning. The Sacramento County Hazardous Material Element addresses land use planning concerns associated with hazardous materials.

SEISMIC AND GEOLOGIC HAZARDS

GOAL: Minimize the loss of life, injury, and property damage due to seismic and geological hazards.

Policies

SA-1. The County shall require geotechnical reports and impose the appropriate mitigation measures for new development located in seismic and geologically sensitive areas.

SA-2. The County shall draft and have considered for adoption an ordinance that would require the removal or strengthening of poorly anchored parapets or architectural detailing and unreinforced masonry construction on existing buildings.

SA-3. The County shall support efforts by Federal, State, and other local jurisdictions to investigate local seismic and geological hazards and support those programs that effectively mitigate these hazards.

SA-4. The County shall prohibit development on ground surfaces which exceed 40 percent in slope, such as the bluff areas along the American River. Development shall be set back from these slopes at a distance to be determined by the Public Works Department.

Implementation Measures

A. The County shall designate generalized areas subject to seismic and geological hazards. Development proposals falling within these areas shall include a geotechnical report with appropriate mitigation measures if a seismic or geological hazard is found to exist. (Planning)

B. The County shall draft an ordinance for consideration by the Board of Supervisors to establish a program for the removal or strengthening of poorly anchored parapets or architectural detailing on existing buildings. (Public Works)

FLOODING

GOAL: Minimize the loss of life, injury, and property damage due to flood hazards.

Policies

SA-5. A comprehensive drainage plan shall be prepared for urbanizing streams and their tributaries prior to any development within the 100-year floodplain defined by full watershed development without channel modifications. The plan shall:

a. Determine the future 100-year flood elevations associated with planned and full development of the watershed;

b. Determine the future 100-year floodplain boundaries for both flood elevations (planned and full development) based on minimum 2-foot contour intervals;

c. Assess the feasibility of gravity drainage into the existing flowline of the stream;

d. Assess the feasibility of alternative means of drainage into the stream;

e. Identify potential locations for sedimentation ponds and other stormwater treatment facilities;

f. Determine the minimum lowering of the stream bottom necessary and develop a channel design consistent with General Plan policies;

g. Determine the location and extent of marsh, vernal pool and riparian habitat; and

h. Develop measures for protecting and mitigating natural habitat.

i. Develop measures to ensure vector abatement control.

This policy is not applicable to downstream portions of urbanizing creeks identified as infill areas in Public Works Department policies for which the County does not intend to prepare master drainage plans.

SA-6. The County will participate through the Sacramento Area Flood Control Agency in obtaining federal authorization for construction of a backbone flood control project along the Sacramento and American Rivers and the immediate connection of local internal streams to these rivers. The backbone project should provide 200 year flood protection.

SA-7. New and modified bridge structures shall not cause an increase in water surface elevations of the 100-year floodplain exceeding one foot, unless analysis clearly indicates that the physical and/or economic use of upstream property will not be adversely affected.

SA-8. Fill within the 100-year floodplain of rural creeks outside of the Urban Service Boundary is permissible only to accommodate structures (e.g., residential, commercial, accessory) and septic systems, and only when the Board of Supervisors finds that the fill will not impede water flows or storm runoff capacity. Such development shall not cause an increase in base flood elevation of the 100 year floodplain exceeding one foot, unless analysis clearly indicated that the physical and/or economic use of adjacent property within the floodplain will not be adversely affected.

SA-9. The County shall implement the improvement of natural drainage channels in urbanized or urbanizing portions of the County to reduce local flooding. Such improvements shall comply with the General Plan policies contained in the Conservation Element, Urban Streams, Channel Modification Section.

SA-10. The County shall continue local efforts that encourage implementation of the Federal Flood Insurance Program.

SA-11. Where new upstream development in Sacramento County will increase or potentially impact runoff onto parcels downstream in a neighboring jurisdiction, such as the County of Placer and the City of Sacramento, Sacramento County will coordinate with the appropriate neighboring jurisdiction to mitigate such impacts.

SA-12. The County shall require all new urban development projects to incorporate runoff control measures to minimize peak flows of runoff and/or assist in financing or otherwise implementing Comprehensive Drainage Plans.

SA-13. The County shall regulate, through zoning and other ordinances, land use and development in all areas subject to potential flooding and prohibit urban uses on unprotected flood land.

SA-14. Sacramento County will participate with the City of Sacramento, the Army Corps of Engineers and other Federal, State and local governments and agencies to develop policies, to finance, construct, and plan flood improvements to eliminate flooding in Sacramento County.

SA-15. Deny creation of parcels that do not have buildable areas outside the 100-year floodplain. The buildable area may be constructed by the placement of fill as long as it conforms with other adopted floodplain policies.

SA-16. For residential zoning, the area outside the 100-year floodplain must be contiguous or reasonably situated to provide buildable area for a residence and associated structures. Examples of structures include swimming pools, sheds, barns, detached garages, and other outbuildings that are normally associated with residential development.

SA-17. Vehicular access to the buildable area of newly created parcels must be at or above the 10-year flood elevation. Exceptions may be made when the existing public street from which access is obtained is below the 10-year flood elevation.

SA-18. Watercourse crossings shall be minimized. Creation of lots that require watercourse crossings for single lots, or that will likely encourage watercourse crossings to be built by property owners (lots with useable area on both sides of a watercourse) will not be allowed.

SA-19. Levees for the purpose of floodplain reclamation shall be strongly discouraged.

SA-20. If levee construction is approved to reclaim floodplain for new development then, 200-year flood protection is required.

SA-21. Areas within a 100-year floodplain shall not be upzoned to a more intensive use unless and until a Master Drainage Plan is prepared that identifies areas of the floodplain that may be developed.

Implementation Measures

A. Revise drainage fees to finance comprehensive drainage plans for urban streams. (Public Works)

C. Identify all parcels within rural floodplains where zoning would allow creation of additional parcels and rezone accordingly. (Planning)

D. The County shall draft an ordinance which imposes measures on projects constructed during the rainy season to minimize the amount of silt entering storm drainage systems. (Public Works)

E. Obtain Federal authorization for construction of a backbone flood control project along the Sacramento and American Rivers. (SAFCA)

FIRE HAZARDS

GOAL: Minimize the loss of life, injury, and property damage due to fire hazards.

Policies

SA-22. The County shall require that all new development meets the local fire district standards for adequate water supply and pressure, fire hydrants, and access to structures by fire fighting equipment and personnel.

SA-23. The County shall require, unless it is deemed infeasible to do so, the use of mechanical vegetation control in lieu of burning or the use of chemicals in areas where hazards from natural cover must be eliminated, such as levees and vacant lots.

SA-24. The County shall work with local fire districts to develop high visibility fire prevention programs, including those which provide voluntary home inspections and awareness of home fire prevention measures.

SA-25. During the Development Plan Review process, the County shall require, where appropriate, the use of fire resistant landscaping and building materials for new developments that are cost effective.

SA-26. The County shall require, to the maximum extent feasible, on-site fire suppression systems for all new commercial and industrial development to reduce the dependence on fire department equipment and personnel.

Implementation Measures

A. The County shall request the Fire Advisory Board to propose measures that will assist in the prevention of fire in new and existing structures throughout the County. (Fire Advisory Board)

EMERGENCY RESPONSE

GOAL: An Emergency Preparedness System that can effectively respond in the event of a natural or man-made disaster.

Policies

SA-27. The County shall continue to maintain, periodically update, and test the effectiveness of its Emergency Response Plan.

SA-28. The County shall continue its coordinative efforts, including evacuation planning, with service agencies, the cities within the County, and cities within surrounding counties.

SA-29. The County shall increase its efforts to inform and educate the general public of disaster response and emergency preparedness procedures.

SA-30. The County shall insure that the siting of critical emergency response facilities such as hospitals, fire, sheriff's offices and substations, and other emergency service facilities and utilities have minimal exposure to flooding, seismic and geological effects, fire, and explosions.

SA-31. The County shall require that high intensity land uses proposed in areas highly susceptible to multiple hazards, such as the Delta, provide mitigation measures that include emergency evacuation routes. Consideration shall be given to the need for additional roads, particularly in the Delta, that may serve as evacuation routes.

Implementation Measures

A. The County shall continue to provide a high visibility promotional program to inform the general public of disaster response and emergency preparedness procedures. (General Services Department - Emergency Operations)

B. The County shall revise its zoning designations to include zones not suitable for essential services due to potential hazards. (Planning)

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Section II

SEISMIC AND GEOLOGIC HAZARDS
TECHNICAL DISCUSSION

GEOLOGIC ENVIRONMENT OF SACRAMENTO COUNTY

The present-day landscape of Sacramento County has been shaped over time by the ongoing processes of erosion and deposition. Material eroded from the ancestral Sierra Nevada Mountains, formed over 100 million years ago, was deposited in an ancient sea that once occupied the Sacramento Valley floor. As this ancient sea receded from the valley about 10 to 15 million years ago, tectonic uplifts altered the geomorphology of the Sierra Nevada Mountains. Glaciation, volcanism, and a series of interglacial seas followed the uplifting, adding layers of sediment to the valley floor. Under the present geologic conditions, the alteration of the local geomorphology continues through stream erosion of the valley sediments and subsequent deposition in adjacent floodplains.

A "geomorphic province" is comprised of an area of similar geologic origin and erosional/depositional history. Sacramento County is situated in portions of two geomorphic provinces. By far the largest portion of the County lies in the Great Valley province. A small area in the northeastern part of the County is in the Sierra Nevada province (Figure II-1).

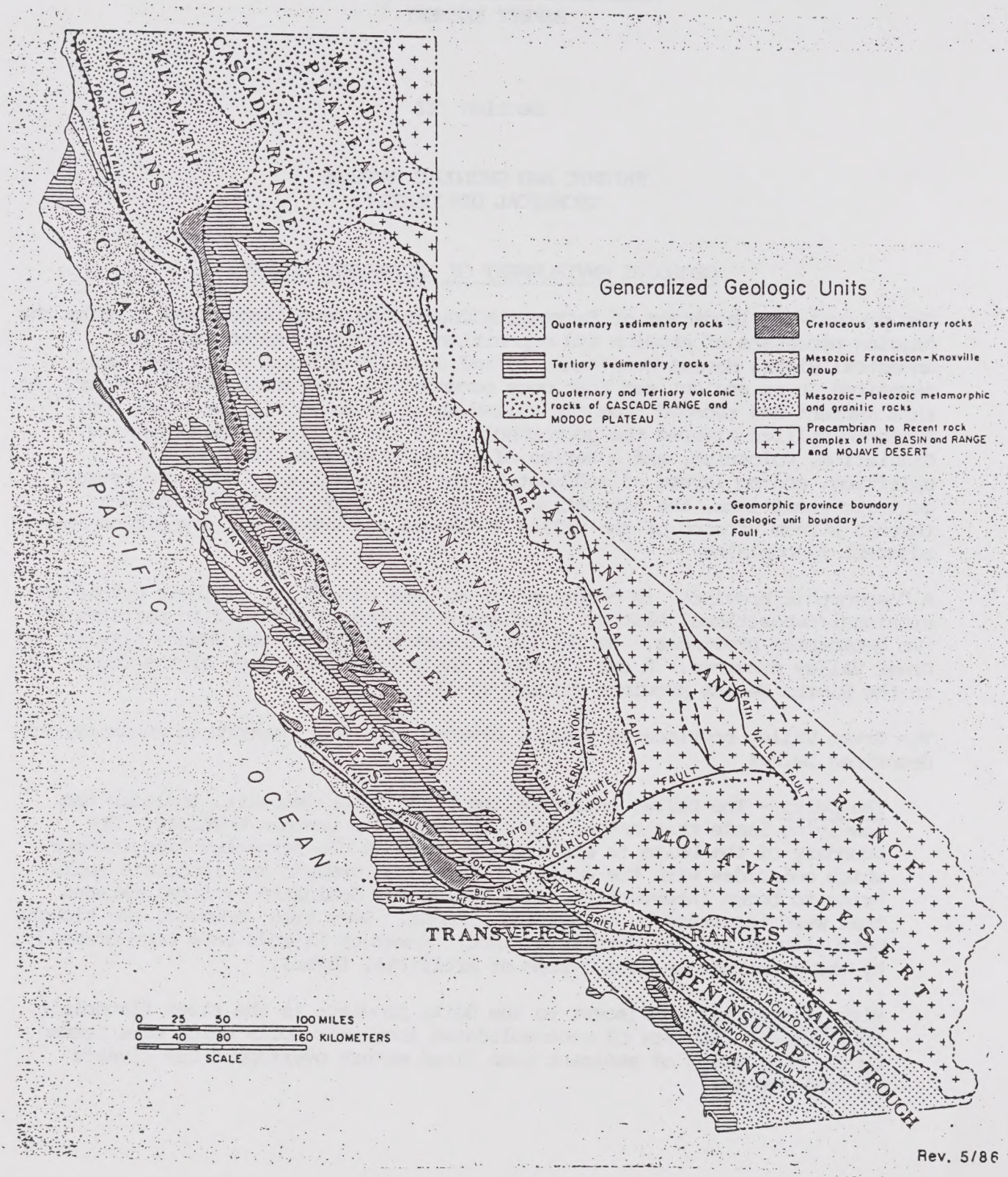
The Great Valley province is further divided into four geomorphic subunits, as described below:

The Delta - The Delta, characterized by Holocene deposits, includes the low-lying lands that extend along the County's western boundary. The boundary of the Delta is arbitrarily fixed at the zero-elevation contour, which coincides with the contact between the organic and inorganic soils. Prior to human intervention, this region was dominated by tidal marshes that were traversed by meandering sloughs. Over time, however, the sloughs were altered and the marshes drained. Numerous islands have been created by the construction of a system of artificial levees.

River Floodplain - Adjacent to the Delta province is the river floodplain. This subunit consists of unconsolidated inorganic soils which were formed by the deposition of sediment when flood waters overtopped the river's natural levees.

Figure II-1

Geomorphic Provinces and Some Principal Faults of California



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Alluvial Plain - Further to the east of the floodplain is an extensive area of former floodplain that has been highly dissected by subsequent stream erosion. The geologic subunit is comprised of older, Quaternary, deposits. This area is underlain by soil which is characterized by layers of hardpan or dense, impervious clay.

Low Foothills - The low foothill area, located east of the alluvial plain, is typified by rolling, boulder-strewn topography and is underlain by moderately consolidated silts, sands, and clays of continental origin. The small area in the northeast part of the County within the Sierra Nevada geomorphic province consists of Pliocene and older deposits and is characterized by steep-sided hills and narrow, rocky stream channels. Stream patterns here are well established and are controlled principally by bedrock features (Figures II-2 and II-3).

SEISMIC HAZARDS

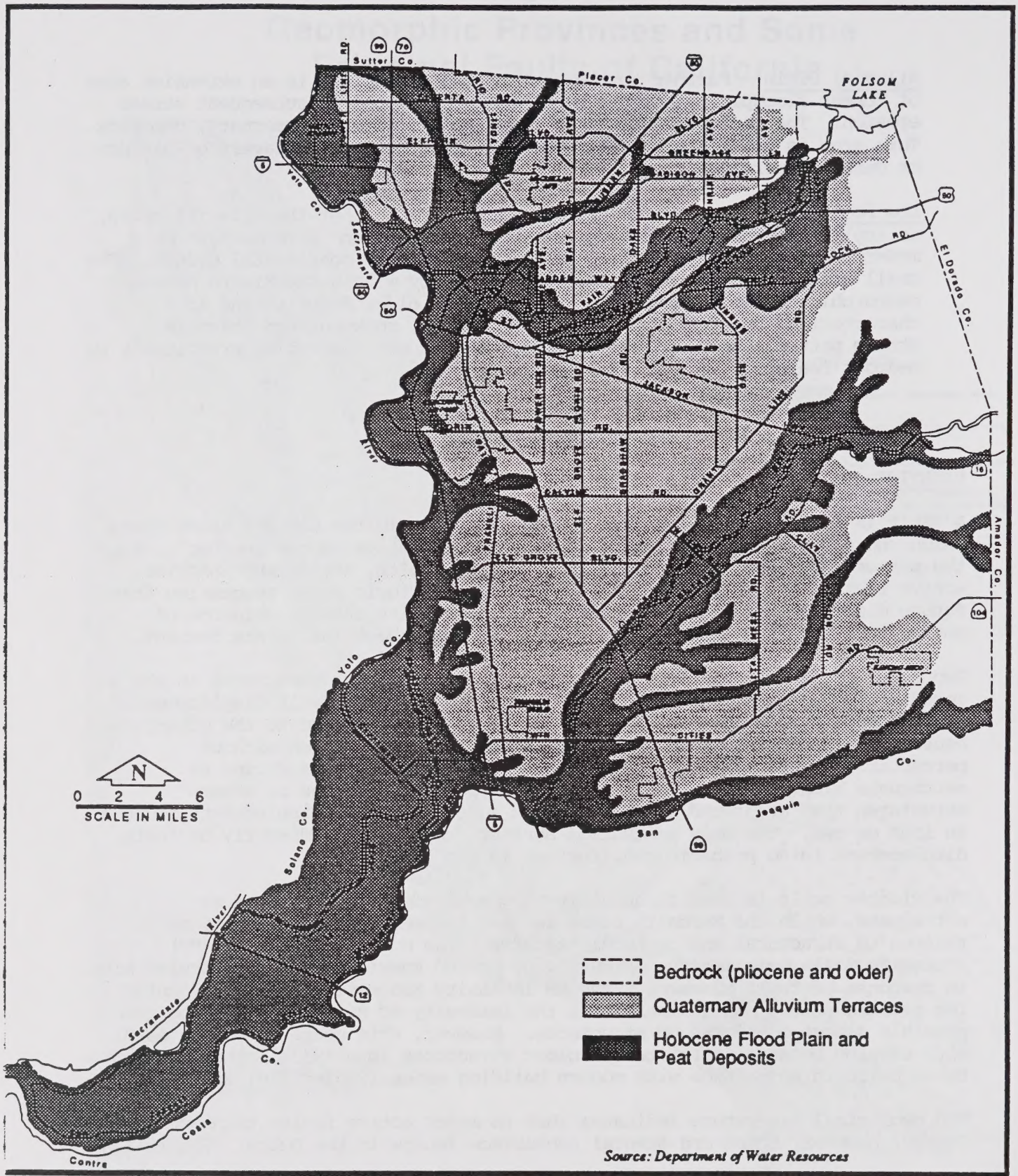
FAULTING

A fault is defined as "a fracture or fracture zone in the earth's crust along which there has been displacement of the sides relative to one another". For the purpose of planning there are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting that future displacement may be expected. Inactive faults show no evidence of movement in recent geologic time, suggesting that these faults are dormant.

Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement. Fault creep, a slow movement of one side of a fault relative to the other, can cause cracking and buckling of sidewalks and foundations even without perceptible groundshaking. Sudden fault displacement occurs during an earthquake event and may result in the collapse of buildings or other structures that are found along the fault zone when fault displacement exceeds an inch or two. The only protection against damage caused directly by fault displacement is to prohibit construction in the fault zone.

The Richter scale is used to quantify the magnitude or strength of an earthquake, while the Mercalli scale is used to measure the intensity as it relates to structural and cultural features. The Modified Mercalli (MM) Intensity Scale measures the intensity of ground shaking at any particular site in response to fault movement. The MM Intensity Scale is useful in planning for seismic safety, as it translates the intensity of earthquake shaking into possible damaging effects on structures. However, this scale should be used with caution because it relates to older structures (pre-1933) rather than to those build in accordance with modern building codes (Tables II-1 and II-2).

The geological literature indicates that no major active faults transect the County; however, there are several subsurface faults in the Delta. The Midland



Source: Department of Water Resources

GENERAL PLAN

Figure II-2
Geological Formations of Sacramento County

Prepared by the Sacramento County Planning and Community Development Department

Figure II-3

GEOLOGIC TIME SCALE

ERAS	PERIODS	duration (millions)	years ago (millions)
CENOZOIC	QUATERNARY Recent Pleistocene	1	
	TERTIARY Pliocene	12	1
	Miocene	12	
	Oligocene	11	
	Eocene	22	
	Paleocene	5	63
MESOZOIC	CRETACEOUS	72	135
	JURASSIC	46	181
	TRIASSIC	49	230
PALEOZOIC	PERMIAN	50	280
	PENNSYLVANIAN	30	310
	MISSISSIPIAN	35	345
	DEVONIAN	60	405
	SILURIAN	20	425
	ORDOVICIAN	75	500
	CAMBRIAN	100	600

TABLE II-1

HISTORICALLY ACTIVE FAULTS IN THE VICINITY OF SACRAMENTO COUNTY

Fault	Approximate Distance from West Sacramento (Miles)	Historical Seismicity	Maximum Probable Earthquake*
San Andreas	80	1906 (8.25)*	7.5
Vaca	35	1892 (6.5-7)	6.0
Hayward	60	1836, 1868 (7.25)	6.5-7
Calaveras	50	1861 (6.5-7)	6.5-7
Concord-Green Valley	45	1955 (5.4; small events on Green Valley; creep on Concord)	6.0
Midland	20	Possible source of major historic earthquake (1895?)	6.9
Dunnigan Hills	18	Unknown	6.0
Foothill Fault System	25	Oroville 1975	6.0

*Richter Scale Readings

Source: Lighthouse Marina EIR/EIS, by EDAW, Inc., November, 1985.

TABLE II-2

MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITY

Scale	Effects
I.	Earthquake shaking not felt.
II.	Shaking Felt by those at rest.
III.	Felt by most people indoors; some can estimate duration of shaking.
IV.	Felt by most people indoors. Hanging objects swing, windows and doors rattle, wooden walls and frames creak.
V.	Felt by everyone indoors; many estimate duration of shaking. Standing autos rock. Crockery clashes, dishes rattle, and glasses clink. Doors close, open, or swing.
VI.	Felt by everyone indoors and most people outdoors. Many now estimate not only the duration of the shaking, but also its direction and have no doubt as to its cause. Sleepers awaken. Liquids disturbed, some spilled. Small unstable objects displaced. Weak plaster and weak materials crack.
VII.	Many are frightened and run outdoors. People walk unsteadily. Pictures thrown of walls, books off shelves. Dishes or glasses broken. Weak chimneys break at rooflines. Plaster, loose bricks, unbraced parapets fall. Concrete irrigation ditches damages.
VIII.	Difficult to stand. Shaking noticed by auto drivers. Waves on ponds. Small slides and cave-ins along sand or gravel banks. Stucco and some masonry walls fall. Chimneys, factory stacks, towers, elevated tanks twist or fall.
IX.	General fright. People thrown to the ground. Steering of autos affected. Branches broken from trees. General damage to foundations and frame structures. Reservoirs seriously damaged. Underground pipes broken.
X.	General panic. Conspicuous cracks in ground. Most masonry and frame structures destroyed along with their foundations. Some well-built wooden structures and bridges are destroyed. Serious damage to dams, dikes, and embankments. Railroads bent slightly.
XI.	General panic. Large landslides. Water thrown out of banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flatland. General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.
XII.	General panic. Damage nearly total, the ultimate catastrophe. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

Source: California Division of Mines and Geology, 1973.

fault, buried under alluvium, extends north of Bethel Island in the Delta to the east of Lake Berryessa and is considered inactive but possibly capable of generating a near 7.0 (Richter Scale) earthquake. This figure is speculative based on a 1895 earthquake measuring 6.9 on the Richter Scale with an epicenter possibly in the Midland Fault vicinity. However, oil and gas companies exploring the area's energy potential have identified several subsurface faults, none of which show any recent surface rupture. A second, presumably inactive, fault is in the vicinity of Citrus Heights near Antelope Road. This fault's only exposure is along a railroad cut where offsetting geologic beds can be seen. Neither the lateral extent of the trace, the magnitude of the offset, nor the age of faulting has been determined. To the east, the Bear Mountain fault zone trends northwest-southeast through Amador and El Dorado Counties. Geologists believe this series of faults has not been active in historic time. Figure II-4 identifies the faults in close proximity to Sacramento County.

While Sacramento County has experienced relatively little seismic activity, faulting in neighboring regions, especially the San Francisco Bay area and the Sierra Nevada, suggests that the County could be affected by future ground motion originating elsewhere (Table II-3). The greatest amount of groundshaking experienced in the County occurred on April 21, 1892, when an earthquake shook Yolo County between Winters and Vacaville. While the damage in Yolo County was severe, the damage in Sacramento County was substantially less. Damage to buildings in Sacramento was limited to statuary falling from building tops and cracks in chimneys. The 1906 San Francisco earthquake generated little shaking in Sacramento County and damage locally was limited to minor cracks in a local post office and jail. Similarly, Sacramento County suffered little damage from the October 17, 1989 Loma Prieta earthquake, which was felt over an area covering 400,000 square miles from Los Angeles to the California-Oregon border. The earthquake measured 7.1 on the Richter Scale; the epicenter was located along the San Andreas fault beneath the Santa Cruz Mountains, about 60 miles southeast of San Francisco. The San Francisco Bay region suffered over $6 billion in property damage and 62 lives were lost.

GROUNDSHAKING

Groundshaking is motion that occurs as a result of energy released during faulting. The damage or collapse of buildings and other structures caused by groundshaking is among the most serious seismic hazards. Damage to structures from this vibration, or groundshaking, is caused by the transmission of earthquake vibrations from the ground to the structure. The intensity of shaking and its potential impact on buildings is determined by the physical characteristics of the underlying soil and rock, building materials and workmanship, earthquake magnitude and location of epicenter, and the character and duration of ground motion. Much of the County is located on alluvium which increases the amplitude of the earthquake wave. Ground motion lasts longer and waves are amplified on loose, water-saturated materials than on solid rock. As a result, structures located on alluvium typically suffer greater damage than those located on solid rock.

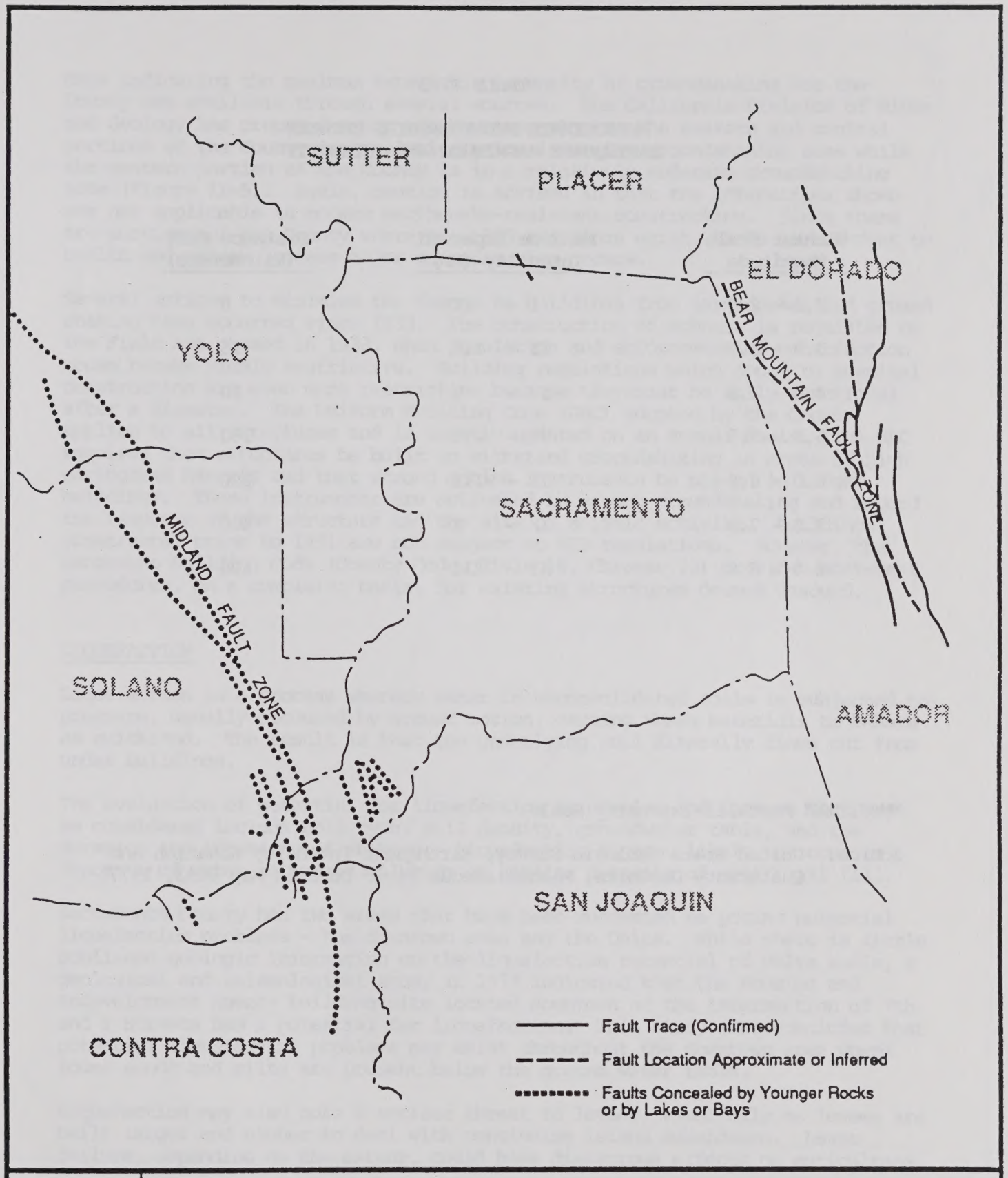


Figure II-4
Faults in the Environs of Sacramento County

Prepared by the Sacramento County Planning and Community Development Department

TABLE II-3

APPROXIMATE RELATIONSHIPS BETWEEN EARTHQUAKE MAGNITUDE AND INTENSITY

Richter Scale Magnitude	Maximum Expected Intensity (MM)*	Distance Felt (kilometers)
2.0 - 2.9	I - II	0
3.0 - 3.9	II - III	15
4.0 - 4.9	IV - V	80
5.0 - 5.9	VI - VII	150
6.0 - 6.9	VII - VIII	220
7.0 - 7.9	IX - X	400
8.0 - 8.9	XI - XII	600

*Modified Mercalli Intensity Scale.

Source: United State Geologic Survey, Earthquake Intensity Zonation and Quaternary Deposits, Miscellaneous Field Studies Map 9093, 1977.

Maps indicating the maximum expectable intensity of groundshaking for the County are available through several sources. The California Division of Mines and Geology has prepared a map of the state showing the eastern and central portions of the County in a relatively low intensity groundshaking zone while the western portion of the County is in a relatively moderate groundshaking zone (Figure II-5). Again, caution is advised in that the intensities shown are not applicable to modern earthquake-resistant construction. Since there are portions of the County where pre-1933 buildings exist, there is a threat to health and safety in case major groundshaking occurs.

Several actions to minimize the damage to buildings from earthquakes and ground shaking have occurred since 1933. The construction of schools is regulated by the Field Act passed in 1933, when regulation and enforcement of construction codes became highly restrictive. Building regulations which apply to hospital construction are even more restrictive because they must be fully functional after a disaster. The Uniform Building Code (UBC) adopted by the County applies to all structures and is usually updated on an annual basis. The UBC requires that structures be built to withstand groundshaking in areas of high earthquake hazards and that strong motion instruments be placed in larger buildings. These instruments are activated by strong groundshaking and record the response of the structure and the site of seismic activity. Buildings constructed prior to 1951 are not subject to UCB regulations. However, the Dangerous Building Code (County Code, Title 16, Chapter 22) provides abatement procedures, on a complaint basis, for existing structures deemed unsound.

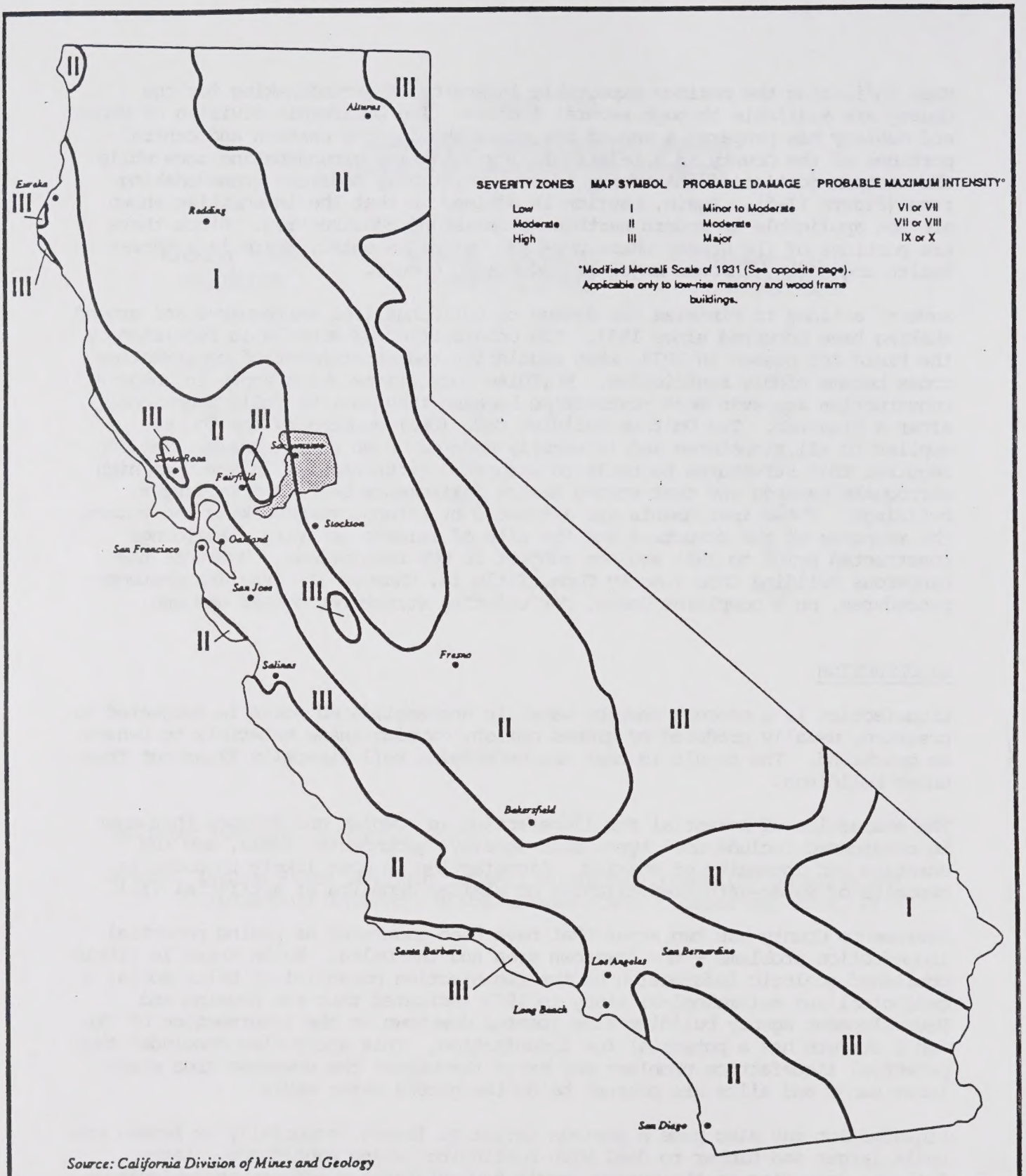
LIQUEFACTION

Liquefaction is a process whereby water in unconsolidated soils is subjected to pressure, usually produced by ground motion, causing these materials to behave as quicksand. The result is that the underlying soil literally flows out from under buildings.

The evaluation of potential for liquefaction is complex and factors that must be considered include soil type, soil density, groundwater table, and the duration and intensity of shaking. Liquefaction is most likely to occur in deposits of water-saturated alluvium or similar deposits of artificial fill.

Sacramento County has two areas that have been suggested as posing potential liquefaction problems - the downtown area and the Delta. While there is little published geologic information on the liquefaction potential of Delta soils, a geological and seismological study in 1972 indicated that the Housing and Redevelopment Agency building site located downtown at the intersection of 7th and I Streets has a potential for liquefaction. This study also concluded that potential liquefaction problems may exist throughout the downtown area where loose sands and silts are present below the ground water table.

Liquefaction may also pose a serious threat to levees, especially as levees are built larger and higher to deal with continuing island subsidence. Levee failure, depending on the extent, could have disastrous effects on agriculture,



Source: California Division of Mines and Geology

Figure II-5
Maximum Expectable Earthquake Intensity

Prepared by the Sacramento County Planning and Community Development Department

natural gas supply, fisheries, and salt water intrusion of the San Francisco Bay.

SEICHES

Seiches are earthquake-generated waves within enclosed or restricted bodies of water, such as lakes, channels, and reservoirs. The waves generated can reach tens of feet high and have devastating effects on people and property. Earthquakes occurring miles away can produce seiches in local bodies of water which could overtop and damage levees and dams and cause water to inundate surroundings. In 1868, an earthquake along the Hayward fault in the San Francisco Bay Area generated a seiche along the Sacramento River. According to the review of the geologic research, 65% of the Delta levees are subject to overtopping and subsequent failure. Such levee failure could have disastrous affects on local economies and human life (Figure II-6).

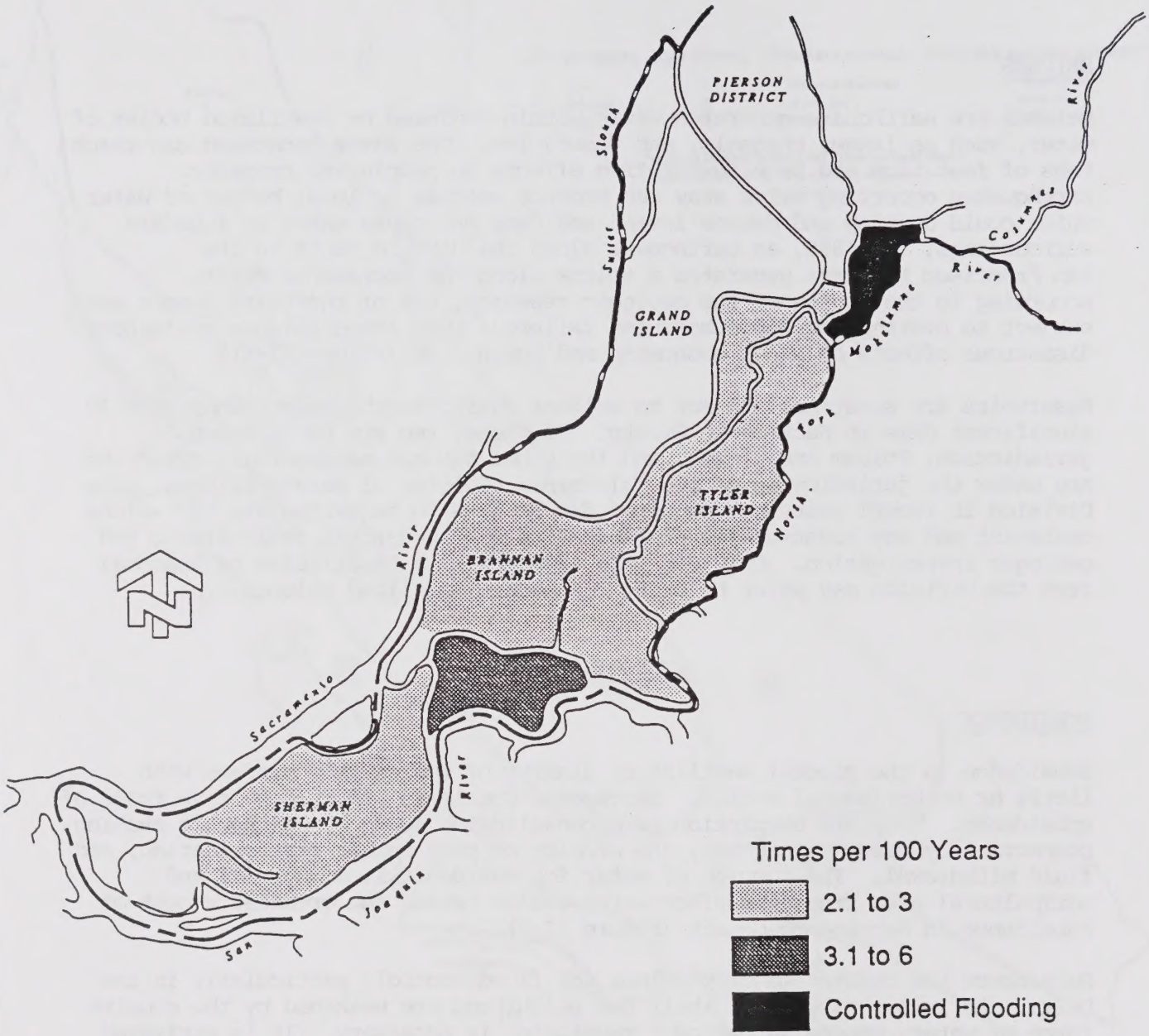
Reservoirs are sometimes subject to seiches during earthquakes. There are 12 significant dams in Sacramento County. Of these, two are under federal jurisdiction, Folsom and Nimbus, and the other ten are nonfederally owned and are under the jurisdiction of the California Division of Safety of Dams. The Division in recent years has required dam designs to be earthquake and seiche resistant and any construction or alteration must undergo a full seismic and geologic investigation. Only upon the issuance of a Certificate of Approval from the Division may water be stored exceeding specified volumes.

GEOLOGIC HAZARDS

SUBSIDENCE

Subsidence is the gradual settling or sinking of the earth's surface with little or no horizontal motion. Sacramento County is affected by five types of subsidence. They are compaction of unconsolidated soils by earthquake shaking, compaction by heavy structures, the erosion of peat soils, peat oxidation, and fluid withdrawal. The pumping of water for residential, commercial and agricultural uses from subsurface water tables causes the greatest amount of subsidence in Sacramento County (Figure II-7).

Subsidence has created major problems for flood control, particularly in the Delta. As levees sink under their own weight and are weakened by the erosive force of water, expensive periodic rebuilding is necessary. It is estimated that the Sacramento-San Joaquin Delta is subsiding at a rate of just over three inches per year. Many islands in the Delta that, at one time, were at or above sea level are now below sea level.

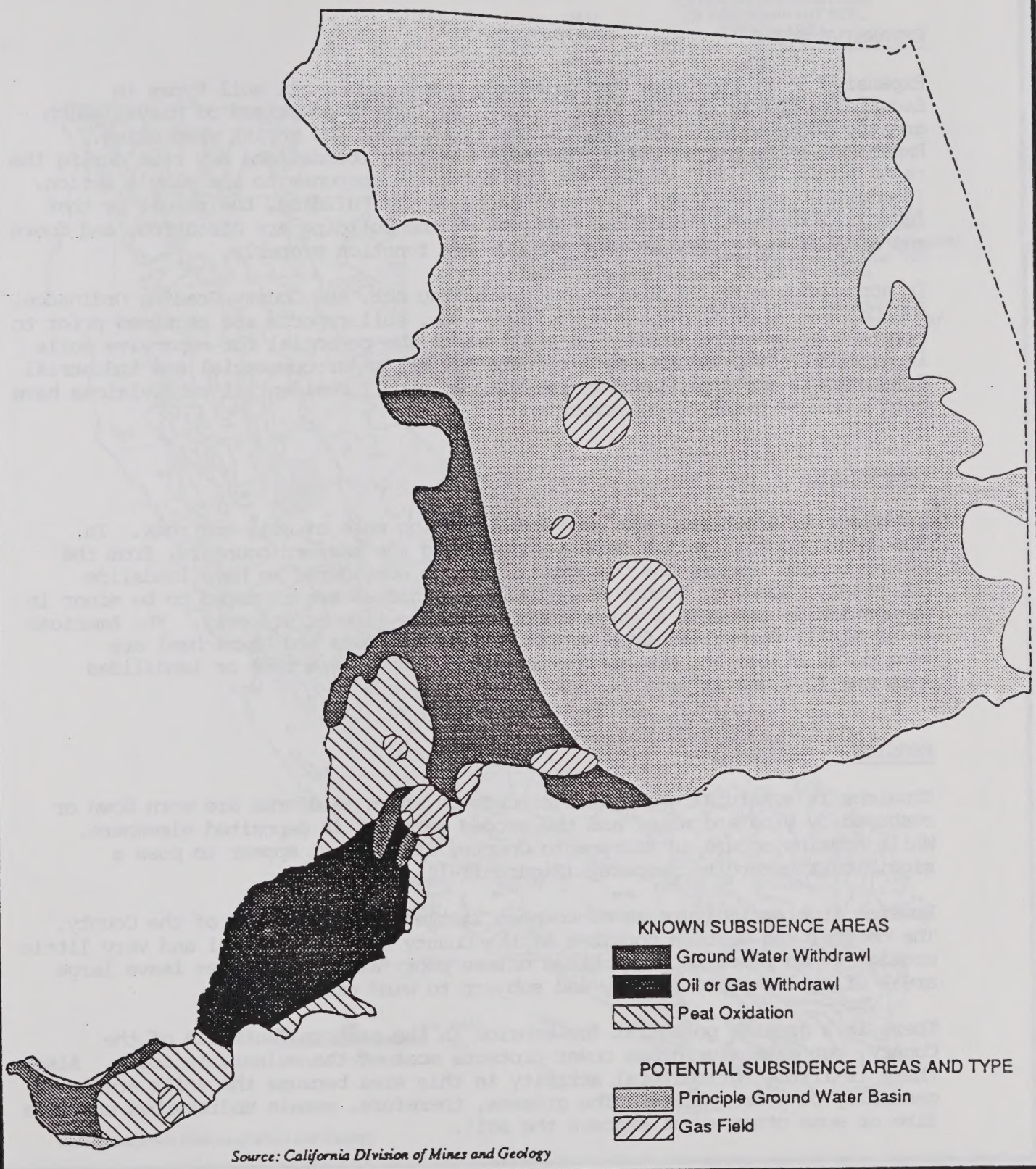


Source: Delta Levees-What Is Their Future? Department of Water Resources, State of California-September, 1973

GENERAL PLAN UPDATE 1988-1991

Figure II-6
Estimated Frequency of Levee Overtopping Under Present Conditions

Prepared by the Sacramento County Planning and Community Development Department



Source: California DIvision of Mines and Geology

Figure II-7
Known and Potential Subsidence Areas in Sacramento County

Prepared by the Sacramento County Planning and Community Development Department

EXPANSIVE SOILS

Expansive soils represent approximately one third of all soil types in Sacramento County (Figure II-8). They are largely comprised of clays, which greatly increase in volume when water is absorbed and shrink when dried. Expansive soils are of concern because building foundations may rise during the rainy season and fall during the dry season in response to the clay's action. If movement varies under different parts of the building, the result is that foundations creak, structural portions of the building are distorted, and doors and windows are warped so that they do not function properly.

In accordance with the State Subdivision Map Act, the County Grading Ordinance, and Chapter 70 of the Uniform Building Code, soil reports are required prior to issuance of building permits in areas where the potential for expansive soils is present. In practice, soil reports for all major commercial and industrial developments and approximately one-quarter of all residential subdivisions have been required prior to construction.

LANDSLIDES

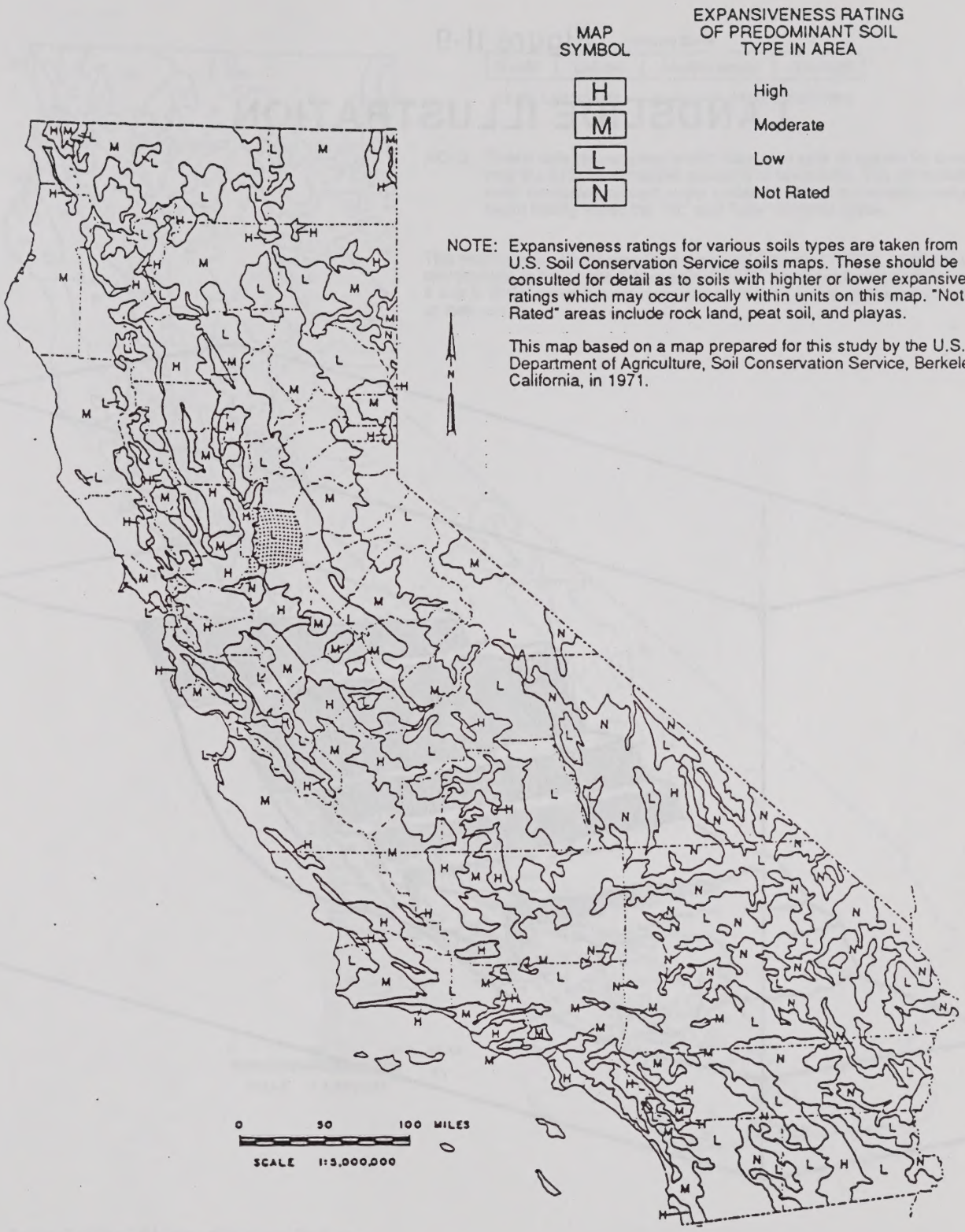
Landslide is a general term used for a falling mass of soil and rock. In Sacramento County, only a narrow strip along the eastern boundary, from the Placer County line to the Cosumnes River, is considered to have landslide potential. However, future slides on these slopes are expected to be minor in nature and do not pose a large scale threat to life or property. The American River Bluffs downstream from Folsom and in Fair Oaks and Carmichael are considered stable and are generally not subject to fracture or landslides (Figures II-9 and II-10).

EROSION

Erosions is a natural geological process by which landforms are worn down or reshaped by wind and water and the eroded material is deposited elsewhere. While erosion occurs in Sacramento County, it does not appear to pose a significant hazard to property (Figure II-11).

Erosion from agriculture seems to pose little problem in most of the County. The central and western portions of the County are fairly level and very little erosion takes place in these areas unless poor farming practices leave large areas of soil exposed and dry and subject to wind erosion.

There is a greater potential for erosion in the eastern foothills of the County, but extensive grass cover protects most of the vulnerable soils. Also, there is little agricultural activity in this area because the soils are generally of poor quality. The grasses, therefore, remain undisturbed unless a fire or some other event exposes the soil.



Source: California Division of Mines and Geology

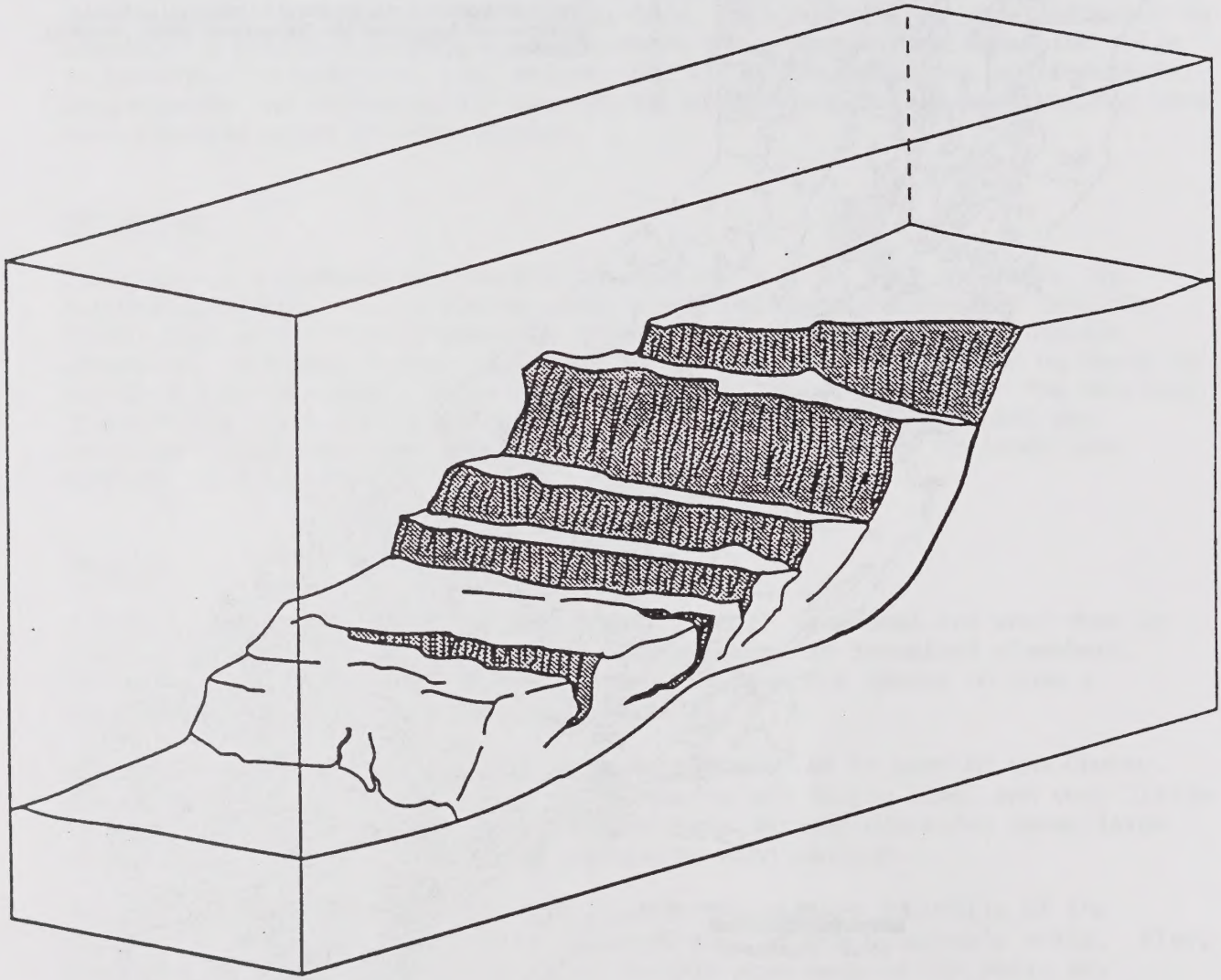
GENERAL PLAN UPDATE 1980-1981

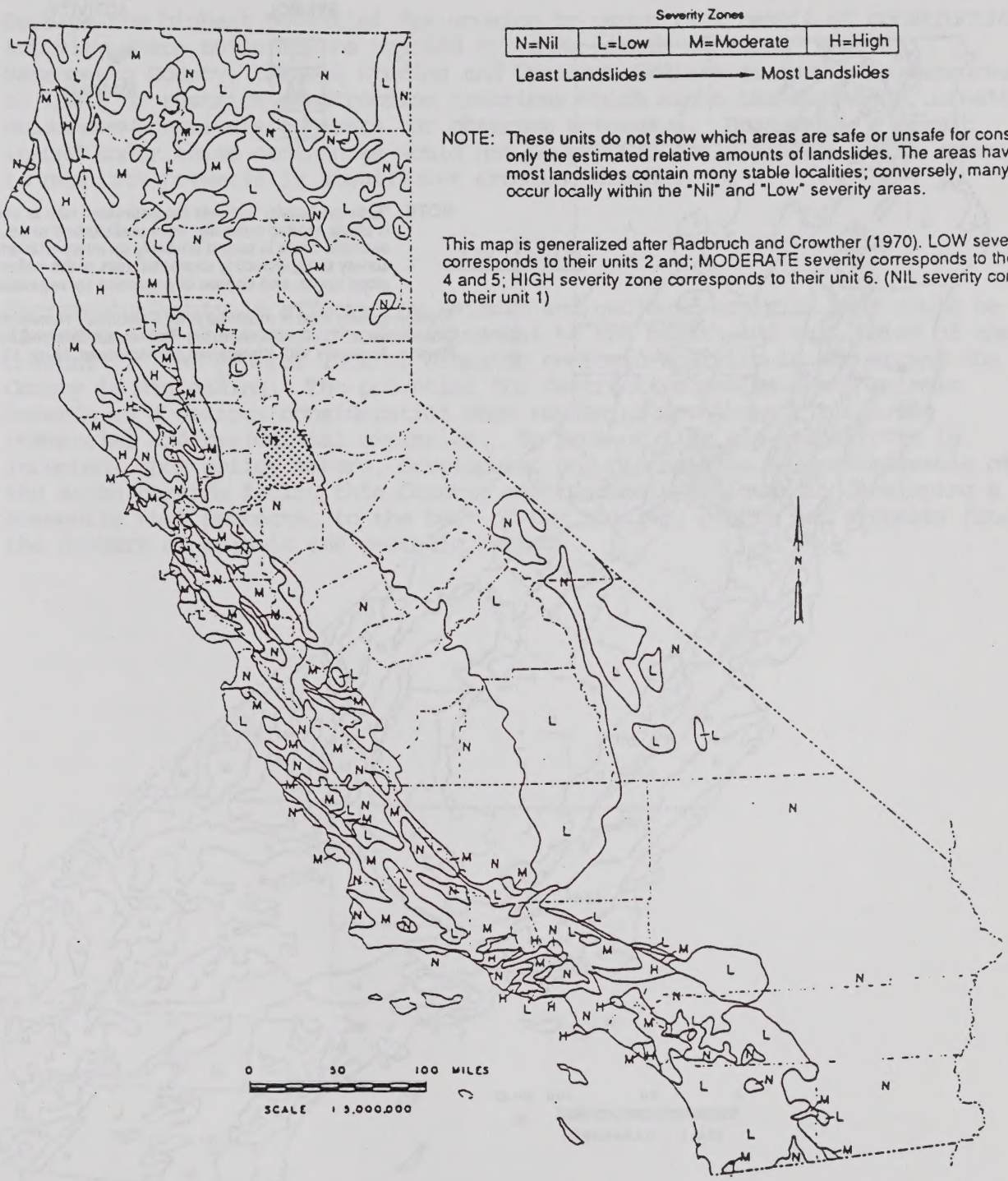
Figure II-8
Expansive Soils in California

Prepared by the Sacramento County Planning and Community Development Department

Figure II-9

LANDSLIDE ILLUSTRATION





NOTE: These units do not show which areas are safe or unsafe for construction, only the estimated relative amounts of landslides. The areas having the most landslides contain many stable localities; conversely, many landslides occur locally within the "Nil" and "Low" severity areas.

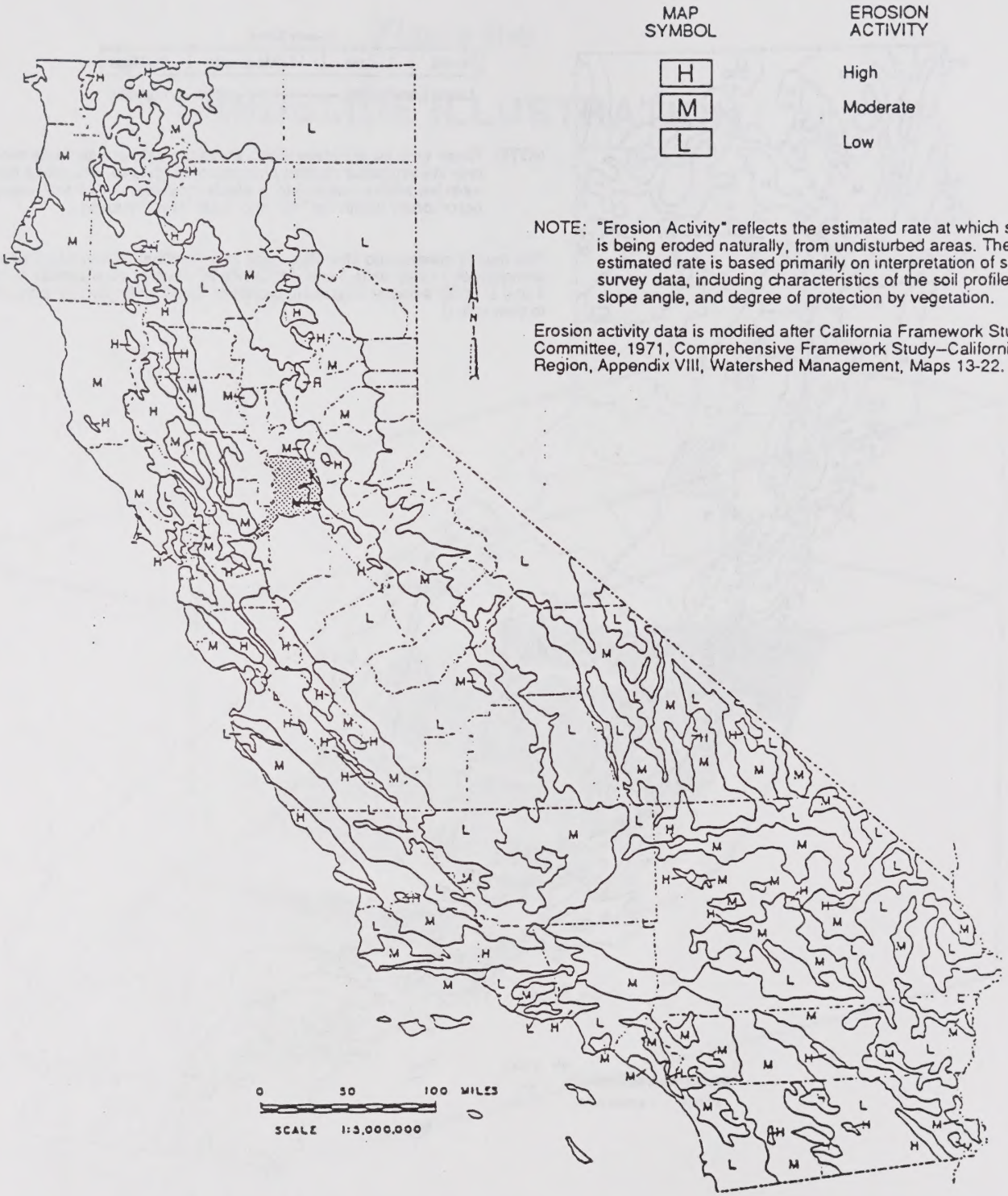
This map is generalized after Radbruch and Crowther (1970). LOW severity zone corresponds to their units 2 and; MODERATE severity corresponds to their units 4 and 5; HIGH severity zone corresponds to their unit 6. (NIL severity corresponds to their unit 1)

Source: California Division of Mines and Geology

GENERAL PLAN UPDATE 1989-1991

Figure II-10
Relative Amounts of Landslides

Prepared by the Sacramento County Planning and Community Development Department



Source: California Division of Mines and Geology

GENERAL PLAN UPDATE 1980-1990

Figure II-11
Erosion Activity

Prepared by the Sacramento County Planning and Community Development Department

Perhaps the highest potential for erosion to occur is a result of construction activity where soils may be exposed for some length of time. However, Sacramento County, through Grading and Drainage Ordinances, provides measures to limit or restrict construction practices which might cause erosion, create a nuisance, constitute a hazard, or obstruct waterways. Presumably a permit issued under these ordinances would not be granted for a project which appeared to generate potentially significant erosion hazards.

CONCLUSION

Sacramento County is affected by seismic and geologic activity that could be disastrous to the economy and detrimental to the health and well being of the community. The general lack of dramatic geologic activity in and around the County is misleading. The potential for destructive geologic and seismic hazards is a serious consideration when reviewing development plans for commercial and residential expansion. To protect life and property it is incumbent upon policy makers, developers, and planners to be knowledgeable of the earth hazards facing this County, and to remain diligent in developing a community that protects, to the best of our ability, people and property from the dangers of seismic and geologic hazards.

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Section III

FLOODING
TECHNICAL DISCUSSION

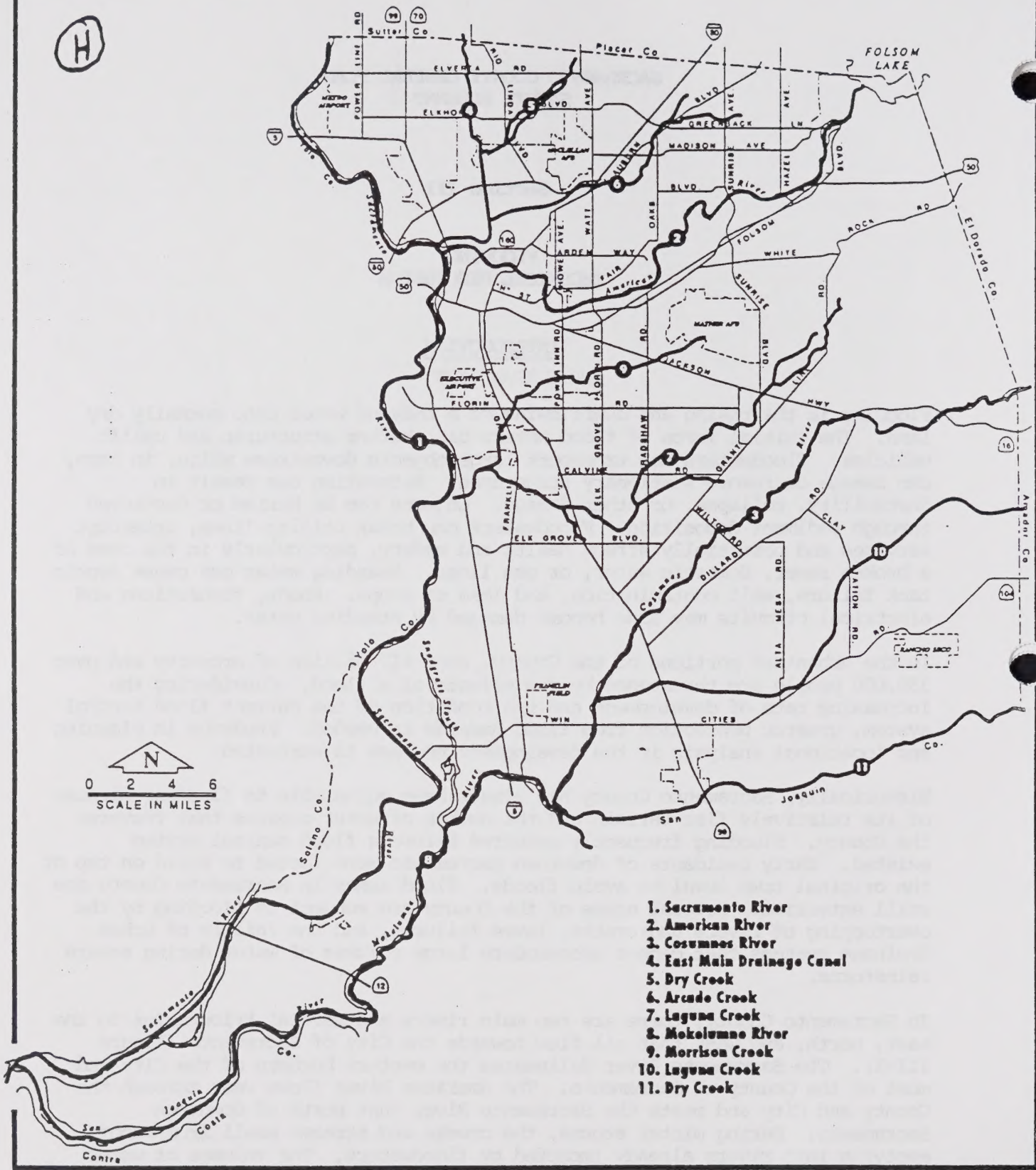
INTRODUCTION

Flooding is the rising and overflowing of a body of water onto normally dry land. The initial force of flood waters can shatter structures and uplift vehicles. Floodwaters can transport large objects downstream which, in turn, can damage or remove stationary structures. Saturation can result in instability, collapse, or other damage. Objects can be buried or destroyed through sediment deposition. Floodwaters can break utility lines, interrupt services and potentially affect health and safety, particularly in the case of a broken sewer, domestic water, or gas lines. Standing water may cause septic tank failure, well contamination, and loss of crops. Roads, foundations and electrical circuits may also become damaged by standing water.

In the urbanized portions of the County, over $17 billion of property and over 350,000 people are threatened by the effects of a flood. Considering the increasing rate of development and the condition of the current flood control system, greater protection from flood hazards is needed. Prudence in planning and locational analysis in the development process is warranted.

Historically, Sacramento County has always been vulnerable to flooding because of its relatively flat terrain and the number of water courses that traverse the County. Flooding frequently occurred before a flood control system existed. Early residents of downtown Sacramento were forced to build on top of the original town level to avoid floods. Flood zones in Sacramento County are still extensive. Several areas of the County are subject to flooding by the overtopping of rivers and creeks, levee failures, and the failure of urban drainage systems that cannot accommodate large volumes of water during severe rainstorms.

In Sacramento County, there are two main rivers and several tributaries to the east, north, and west that all flow towards the City of Sacramento (Figure III-1). The Sacramento River delineates the western borders of the City and most of the County of Sacramento. The American River flows west through the County and City and meets the Sacramento River just north of downtown Sacramento. During winter storms, the creeks and streams swell from runoff emptying into rivers already impacted by floodwaters. The volumes of water increase and the flood control system is tested as the rivers approach the County.

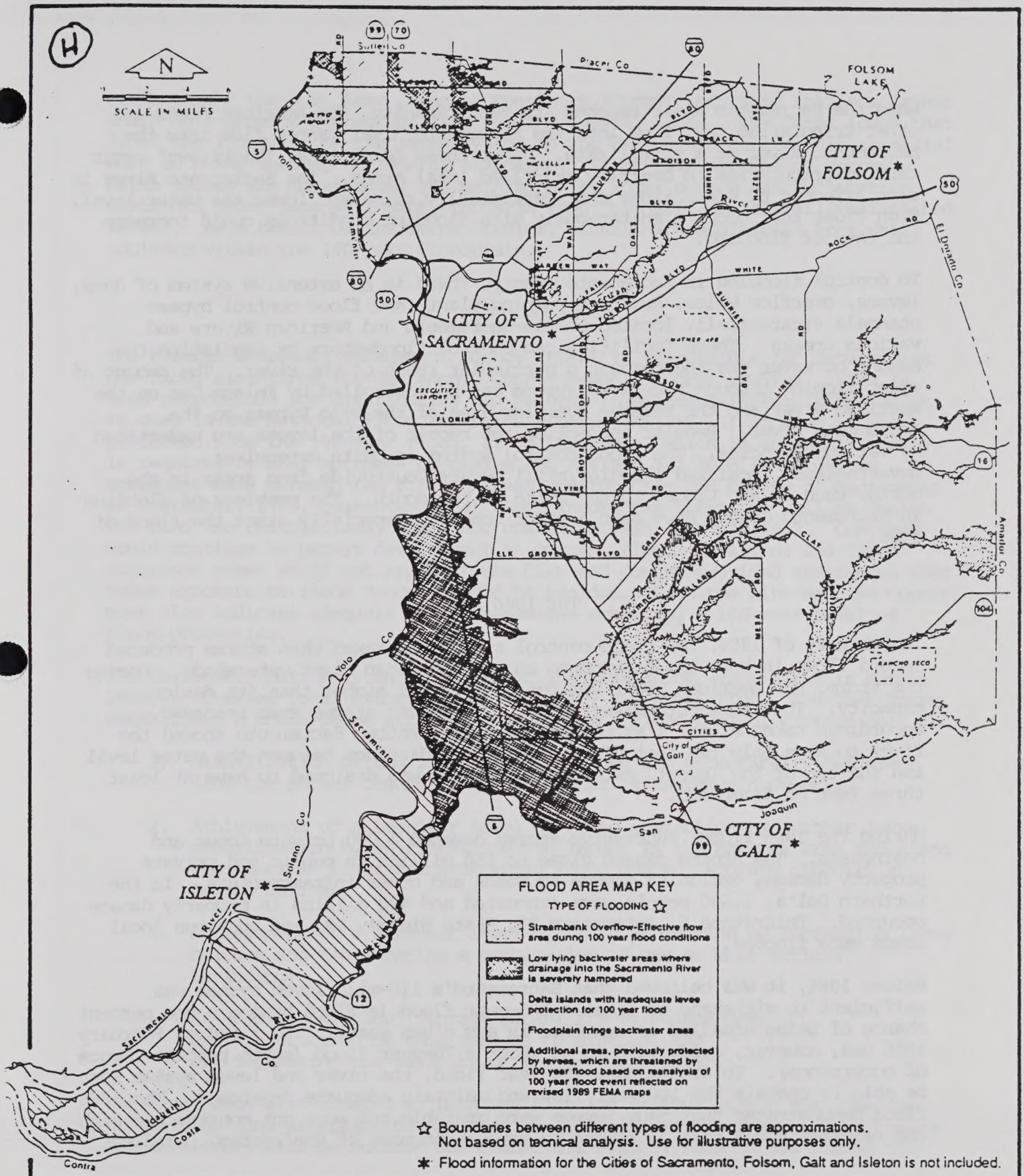


GENERAL PLAN UPDATE

Figure III-1

Sacramento County Waterways

Prepared by the Sacramento County Planning and Community Development Department



GENERAL PLAN

Figure III-1B
Unincorporated Area of Sacramento County
FEMA Flood Areas

Source: Flood lines based on the Federal Emergency Management Agency National Flood Insurance Program, Flood Insurance Rate Map-September 30, 1988

Prepared by the Sacramento County Planning and Community Development Department

When the Sacramento River reaches its peak capacity, the American River and other tributaries that flow into the Sacramento River cannot flow into the Sacramento River at a normal rate. Under these conditions, "backflows" occur causing tributaries to overflow and flood local areas. The Sacramento River is also affected by ocean tides that periodically raise and lower the water level. High tides that occur simultaneously with flooding conditions could increase the rate of flooding.

To control flooding in Sacramento County, there is an extensive system of dams, levees, overflow weirs, drainage pumping plants and flood control bypass channels strategically located on the Sacramento and American Rivers and various creeks. These facilities can control floodwaters by regulating the amount of water passing through a particular reach of the river. The amount of water flowing through the levee system can be controlled by Folsom Dam on the American River and the reserve overflow area of the Yolo Bypass on the Sacramento River. Regular inspection and repair of the levees are undertaken by various agencies. The flood control system is quite extensive; nevertheless, localized flooding still occurs Countywide from areas in the north, such as Rio Linda, to the Delta in the south. The problems of flooding in Sacramento County have been a major concern, especially since the flood of 1986.

THE 1986 FLOOD

In February of 1986, the flood control system was taxed when storms produced record flows in both the Sacramento and the American River watersheds. During the storm, the American River was over 16 percent higher than its design capacity. The Sacramento River was at its highest stages ever recorded. Recordings taken at the I street Bridge near downtown Sacramento showed the river to have only two feet of freeboard (the distance between the water level and the top of the levee), although the system was designed to have at least three feet of freeboard.

During the 1986 flood, successive storms damaged 1,730 private homes and businesses. The storms caused close to $50 million in public and private property damage, excluding damage to roads and other infrastructure. In the northern Delta, 1,600 people were evacuated and $20 million in property damage occurred. Interstate 5, Interstate 80, State Highway 99, and numerous local roads were flooded.

Before 1986, it was believed that Sacramento's 110-mile levee system was sufficient to withstand at least a 100-year flood (a flood having a one percent chance of being equalled or exceeded in any given year). The flood of February 1986 was, however, calculated to be about a 70-year flood (seven percent chance of occurrence). To withstand a 100-year flood, the river and levee system must be able to contain the 100-year flow and maintain adequate freeboard. The 1986 flood demonstrated that many levees were unstable and were not constructed with the required three feet of freeboard throughout most of the system. Studies

conducted by the U.S. Army Corps of Engineers (Corps) indicated that the levees could only provide protection from about a 63-year flood. The Corps found that 32 of the 110 miles of the levee system in the Sacramento area require remedial work to bring them up to federal standards. Sixty-five percent of northern Delta levees are constructed and maintained by local owners and reclamation districts under less stringent standards than "project" or federally-maintained levees. As a result of the Corps studies, significant additional area was included within the 100-year floodplain.

FLOOD POLICY

The Federal Emergency Management Agency (FEMA) is responsible for determining new flood elevations for Sacramento County based on Corps studies. FEMA is also responsible for distributing the Federal Insurance Rate Map (FIRM) which is used in the National Flood Insurance Program (NFIP). If an area is not protected from the 100-year flood, flood insurance, which is extremely costly, is required by most mortgage companies and savings and loan institutions. An agreement made between the U.S. Congress and the City and County of Sacramento in September, 1988, guaranteed that flood insurances rates, as well as design and land use restrictions, would not change between 1988 and 1992. Congress would continue to permit development at current flood elevations and flood insurance rates would not apply if the City and County provided assurances that undue exposure to flood dangers could be avoided. Both the City and the County must also indicate adequate progress towards achieving a 100-year level of flood protection.

The Sacramento Metropolitan Flood Protection Task Force was created in March, 1989, to oversee local efforts in flood policy and protection. The Task Force established a three-phase strategy for improving flood control protection:

1. Stabilization of the levees wherever they are structurally deficient from the Sutter County line to Freeport in Sacramento County;

2. Achievement of a 100-year level of flood protection by further levee stabilization by 1992; raising the levees in the Natomas area and along the American River and increasing flood control storage capacity at Folsom Dam; and

3. Achievement of a 200-year level of flood protection by increasing levee heights and implementing a combination of one or more actions including:

   a) additional flood storage capability at Folsom Dam,
   b) construction of some form of Auburn Dam, and
   c) increasing the capacity of the American River.

The Task Force also created a "Land Use Planning Policy" within the 100-year floodplain. One provision of the Land Use Planning Policy ensures that buyers and developers will be noticed and assume all risk if they locate within the

floodplain. A waiver would be signed to indemnify the City and County against any claims related to flooding. The Sacramento County Water Agency has maintained a policy since 1979 to require hold harmless agreements, if deemed necessary, releasing the County from any liability due to flooding. Ordinance No. 1 of the Water Agency, in addition, provides that written agreements may be required by the Agency Engineer when building permits are issued in flood prone areas. It is anticipated that the Water Agency will also implement new procedures suggested by the Task Force which are: (1) Notice regarding the risk of flooding; (2) A waiver of Claims Agreement; and (3) An assumption of Risk by the developer and landowner involved in flood prone areas.

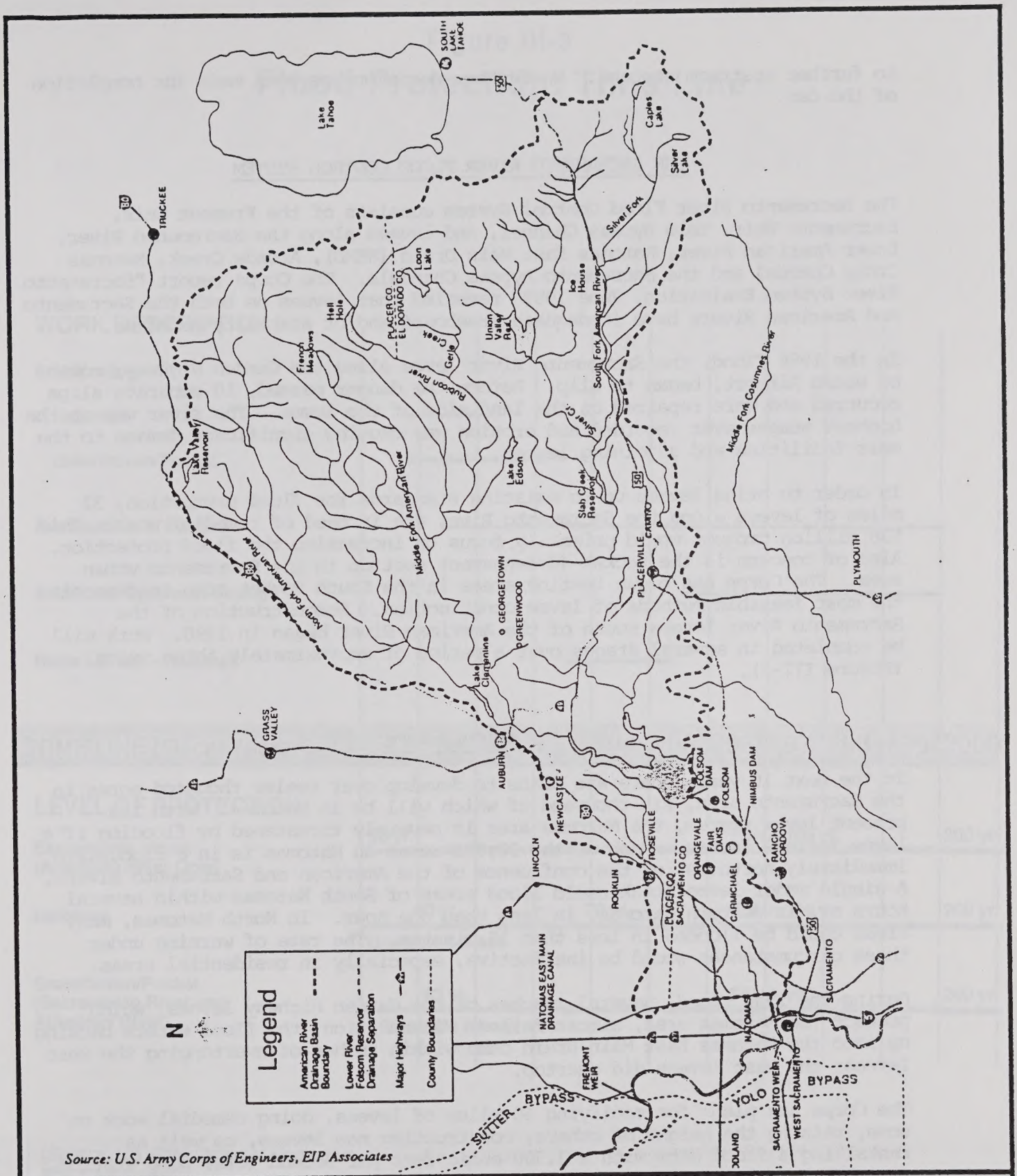
The position of the Sacramento Flood Control Planning Agency is to reaffirm their commitment to Congress not to designate any increase in urbanization in the 100-year floodplain beyond lands already so designated. After studies and cost analyses have been completed for improvements in flood control, a determination can then be made to bring the County up to the 100-year level of flood protection.

AMERICAN RIVER FLOOD CONTROL SYSTEM

The American River Flood Control System consists of the Folsom Dam, Nimbus Dam, an auxiliary dam at Mormon Island, eight earth-filled dikes, and four miles of levees on the north bank of the American River (from Howe Avenue to Arden Way). The System receives runoff from the American River Watershed which contains about 2,100 square miles of the western slope in the Sierra Nevada (Figure III-2). An initial reconnaissance report, "American River Investigation, January 1988" concluded that Folsom Dam and the American River levees are only capable of handling a 70-year flood event. Recommendations were to increase the carrying capacity of the American River below Nimbus Dam, modifying the Folsom Dam spillage, increasing storage capacity at Folsom Lake and for greatest protection (200-year level) construct a new upstream storage facility. Construction could begin as early as 1995, following the preparation of other required studies.

Since its completion in 1956, Folsom Dam has stopped three potentially catastrophic floods from occurring. The Flood of 1986 exceeded Folsom's design for flooding by almost 20 percent. The dam currently offers 63-year flood protection. An increase of one-hundred thousand acre-feet (AF) of storage would give 75-year protection. The Natomas area cannot be guaranteed these rates of protection because of its location at the confluence of the Sacramento and American Rivers.

Construction of the Auburn Dam began in 1967, but was suspended in 1975 after the Oroville Earthquake occurred. Soon after the earthquake, a seismic evaluation was demanded. According to the Corps, seismic concerns have been resolved and 200-year protection could be provided in some areas of the County by completing and operating the Auburn Dam. The Bureau of Reclamation still has federal authorization to build the 2.3 million acre-foot multipurpose dam. Meanwhile, there has been, and continues to be, strong environmental opposition



Source: U.S. Army Corps of Engineers, EIP Associates

GENERAL PLAN UPDATE 1988-1991

Figure III-2
American River Watershed

Prepared by the Sacramento County Planning and Community Development Department

to further upstream storage. No further decision has been made for completion of the dam.

THE SACRAMENTO RIVER FLOOD CONTROL SYSTEM

The Sacramento River Flood Control System consists of the Fremont Weir, Sacramento Weir, Yolo Bypass Channel, and levees along the Sacramento River, Lower American River, Natomas East Main Drain (NEMD), Arcade Creek, Natomas Cross Channel and the Sacramento Bypass Channels. The Corps report "Sacramento River System Evaluation, June 1988" revealed that levees on both the Sacramento and American Rivers have inadequate freeboard and/or stability problems.

In the 1986 Flood, the Sacramento River levee along the Garden Highway, north of Metro Airport, began to slip. Before the danger passed, 10 separate slips occurred and were repaired on the land side of the levee. The river was at the highest stages ever recorded and erosion was causing significant damage to the weir facilities and adjoining levees.

In order to bring levees up to existing standards for flood protection, 32 miles of levees along the Sacramento River are in need of remedial work. This $38 million project would primarily focus on increasing the flood protection. Also of concern is the Pocket (Greenhaven) section in the Sacramento urban area. The Corps has begun testing areas in the South Pocket area to determine the most feasible methods of levee construction. Reconstruction of the Sacramento River levees south of the American River began in 1990. Work will be completed in several stages over a period of approximately three years (Figure III-3).

THE NATOMAS AREA

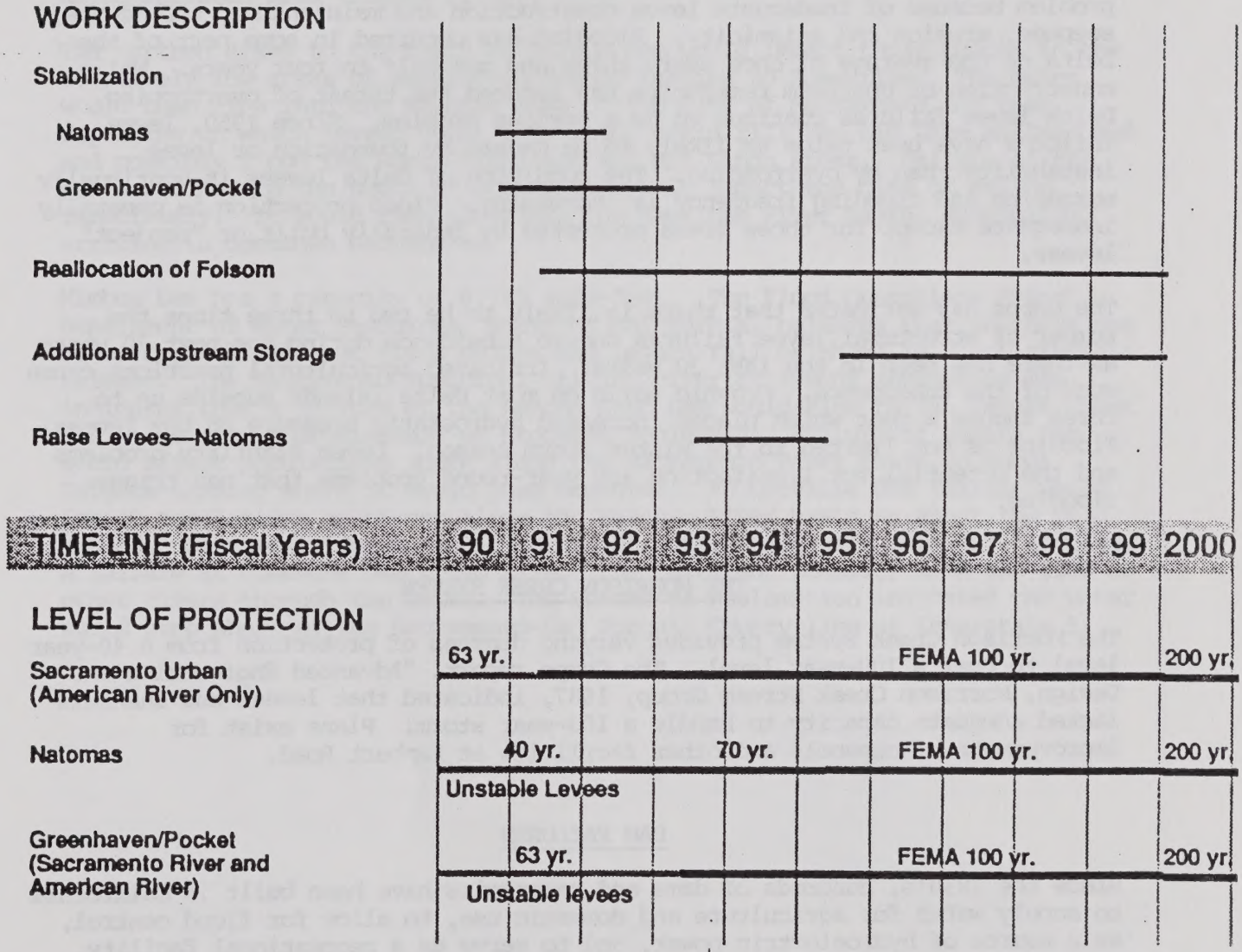
In the next 10 years there are plans to develop over twelve thousand acres in the Sacramento area, six thousand of which will be in Natomas. With its present levee system, the Natomas area is severely threatened by flooding if a levee failure occurs. Much of the 55,000 acres in Natomas is in a floodplain immediately northeast of the confluence of the American and Sacramento Rivers. A single major levee break could flood areas of South Natomas within several hours or, in western Natomas, in less than one hour. In North Natomas, many areas could be flooded in less than 15 minutes. The rate of warning under these circumstances would be ineffective, especially in residential areas.

During the 1986 Flood, several reaches of the Garden Highway levees, which protect the Natomas area, almost failed. In addition, the flood waters backing up into the Natomas East Main Drain came within inches of overtopping the west levees; the east levees did overtop.

The Corps has plans for modifying 60 miles of levees, doing remedial work on some, raising the height of others, constructing new levees, as well as installing a flood gate with a 3,500 cubic feet per second (cfs) pump station.

Figure III-3

Flood Protection: Time Line



(Source: US Army Corps of Engineers, EIP Associates)

Another recommendation by the Corps includes constructing levee and channel improvements along the NEMD. An alternative is to modify the Fremont Weir either by lowering or lengthening it. Because of the current conditions of the levees, the rate at which a flood could occur in the Natomas area is of major concern.

THE DELTA REGION

The Delta Region lies within a floodplain and is faced with a major flooding problem because of inadequate levee construction and maintenance, subsidence, seepage, erosion and seismicity. Flooding has occurred in some part of the Delta on the average of once every three and one-half to four years. While construction of upstream reservoirs has reduced the threat of overtopping, Delta levee failures continue to be a serious problem. Since 1950, levee failures have been twice as likely to be caused by foundation or levee instability than by overtopping. The condition of Delta levees is continually worsening and flooding frequency is increasing. Flood protection is generally inadequate except for those areas protected by federally built or "project" levees.

The Corps has estimated that there is likely to be two to three times the number of structural levee failures due to subsidence during the next 30 years as there has been in the last 30 years. Irrigated agricultural practices cause much of the subsidence. Organic soils on most Delta islands subside up to three inches a year which places increased hydrostatic pressure on the levees. Flooding is not limited to the winter storm season. Levee stability problems and the potential for liquifaction are year-round problems that can trigger flooding.

THE MORRISON CREEK SYSTEM

The Morrison Creek System provides varying degrees of protection from a 40-year level to over a 100-year level. The Corps report, "Advanced Engineering and Design, Morrison Creek Stream Group, 1987, indicated that levees and channels lacked adequate capacity to handle a 100-year storm. Plans exist for improvements of channels and other facilities at Lambert Road.

DAM FAILURES

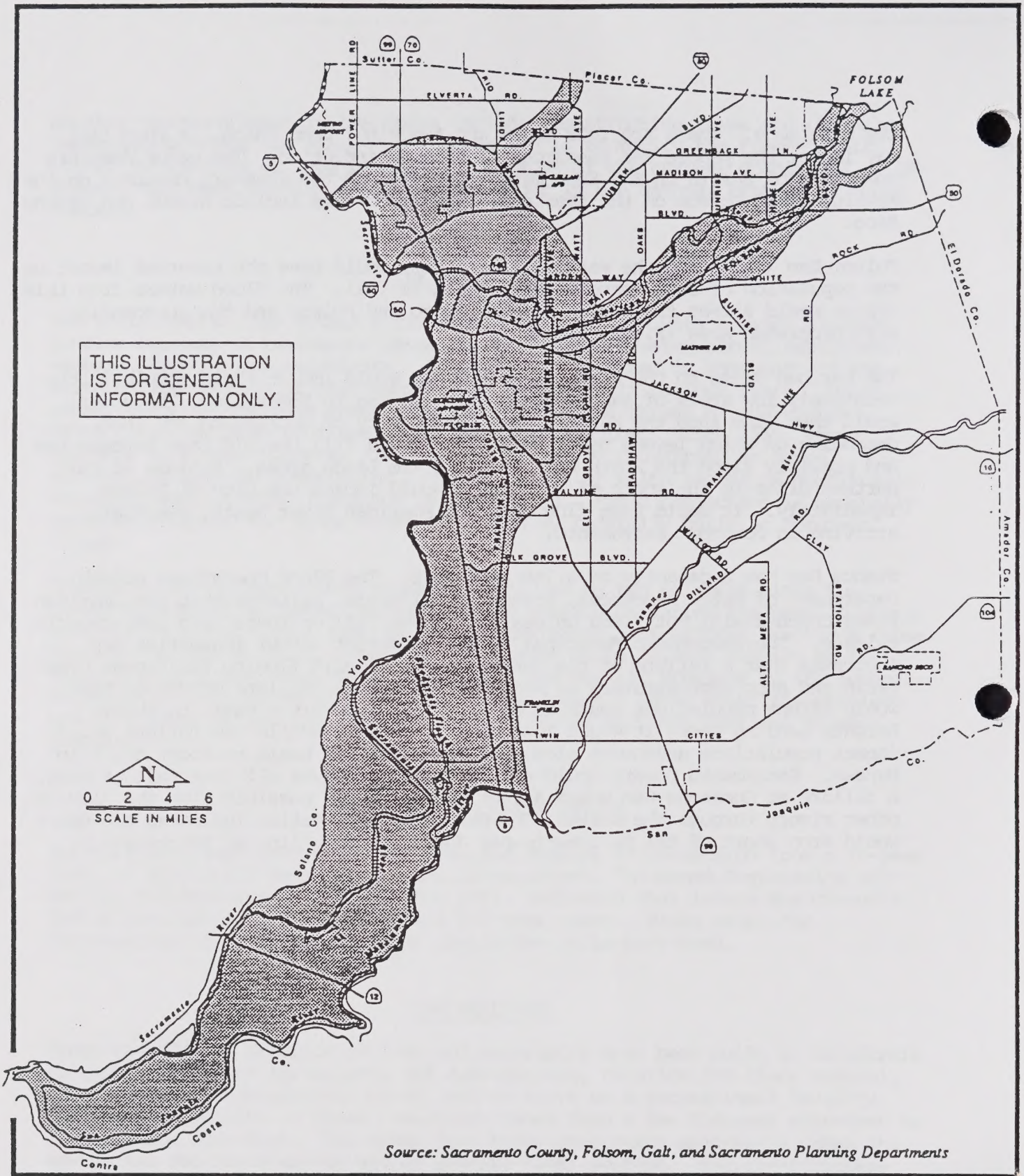
Since the 1850's, hundreds of dams and reservoirs have been built in California to supply water for agriculture and domestic use, to allow for flood control, as a source of hydroelectric power, and to serve as a recreational facility. The storage capacity of these reservoirs range from a few thousand acre-feet to five million acre-feet. The water from these reservoirs eventually makes its way to the Pacific Ocean by way of several river systems. The river systems which flow through or near Sacramento County, and which may affect the population when flooding, are the Sacramento, Feather, American, Cosumnes, and

the Mokelumne. There are four major and two minor dams which, if they fail, may impact the people and resources of this jurisdiction. The major dams are comprised of Shasta on the Sacramento, Oroville on the Feather, Comanche on the Mokelumne and Folsom on the American. The minor dams include Nimbus and Rancho Seco.

Folsom Dam (including the earth-filled dikes) would have the greatest impact on the population of Sacramento County should it fail. The flood waters from this system would affect the cities of Sacramento and Folsom and the surrounding unincorporated area (Figure III-4).

The earthen dikes to the north of Folsom Dam would impact those people in the relatively low areas of Sacramento County leading to Roseville. The water would then flow into the Natomas Area of the City of Sacramento and then, depending on which levees held, this water could fill the old Lake Natomas bed and possibly flood the North Highlands and Rio Linda areas. Failure of the earthen dikes to the south of Folsom Dam would impact the City of Folsom immediately. It would then flow into the American River basin, eventually arriving in downtown Sacramento.

Nimbus Dam has a capacity of 8,760 acre-feet. The Flood Operations Branch, Department of Water Resources, State of California, believes that the American River Channel will not flood unless the levees fail or there is a catastrophic release. The Sacramento Municipal Utility District (SMUD) inundation map indicates that a failure of the Rancho Seco Dam would flow to the Laguna Creek Basin and stop approximately at Stockton Boulevard. Failure of Shasta Dam would affect populations south along the Sacramento River basin to about Knights Landing where it would lose momentum. An Oroville Dam failure would impact populations southwest along the Feather River basin to about the Yolo Bypass. Sacramento County would not be affected unless all dams fail at once. A failure at Comanche Dam would affect the Delta and possibly slow the flow of other rivers through the Delta. The Bureau of Reclamation indicated the water would stop short of the Sacramento-San Joaquin County line at Interstate 5.



Source: Sacramento County, Folsom, Galt, and Sacramento Planning Departments

GENERAL PLAN UPDATE 1988-1990

Figure III-4
Folsom Dam Failure Flood Area

Prepared by the Sacramento County Planning and Community Development Department

Section IV

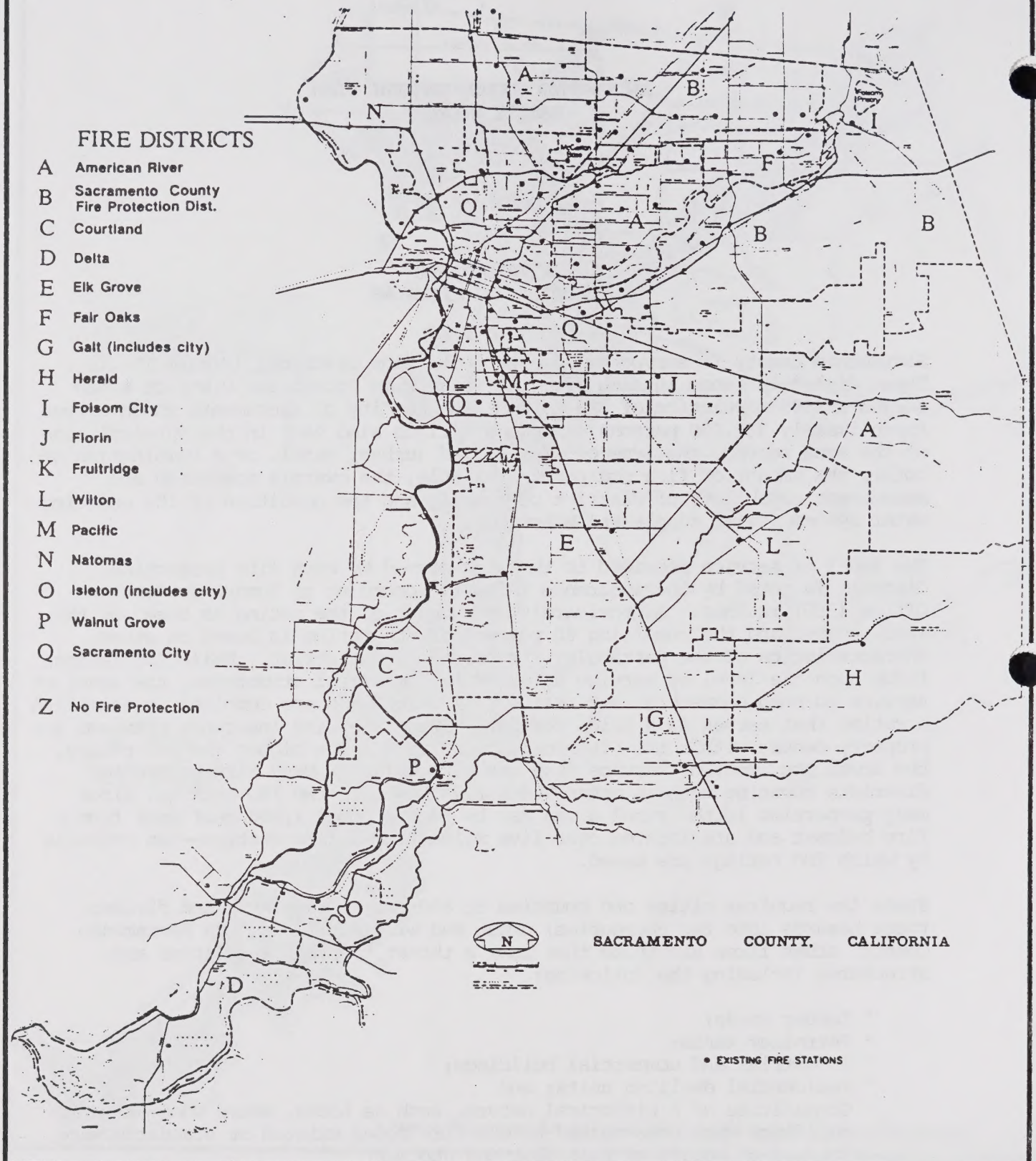
FIRE HAZARDS
TECHNICAL DISCUSSIONS

Sacramento County is served by 17 fire protection districts (Figure IV-1). These districts range in size from the Delta Fire Protection District which serves a 1989 population of 893 persons to the City of Sacramento which serves approximately 340,000 persons. These districts also vary in the physical size of the area served, the type of area served (urban, rural, or a combination of both), the amount of fire equipment available, the overall operation and management capability of district personnel, and the condition of the existing water system (water supply and pressure).

The level of service provided to the area served by each fire protection district is rated by the insurance industry according to Insurance Services Office (ISO) ratings. Approximately 40 percent of the rating is based on the water system and the remaining 60 percent of the rating is based on other characteristics of the particular fire protection district. While ISO ratings focus upon the level of service afforded to commercial structures, the level of service to both commercial and residential structures are combined to establish a rating that serves as a guide for determining the fire insurance premiums for property owners within the district's boundaries. The higher the ISO rating, the lower the level of service that can be provided. Many fire protection districts covering both an urban and rural area have two ISO ratings, since many properties in the rural areas may be located over 1,000 feet away from a fire hydrant and are located over five miles from a fire station--two criteria by which ISO ratings are based.

State law requires cities and counties to address fire hazards and divides these hazards into two categories; urban and wildland fires. In Sacramento County, urban fires are those that pose a threat to urban facilities and structures including the following:

- Lumber yards;
- Petroleum tanks;
- Industrial and commercial buildings;
- Residential dwelling units; and
- Communities of a historical nature, such as Locke, where wood-frame buildings were constructed before fire codes existed or standards were imposed on buildings that abut one another.



GENERAL PLAN UPDATE 1988-1991

Figure IV-1
General Fire Station Locations

Prepared by the Sacramento County Planning and Community Development Department

Wildland fires are those fires that pose a threat to the more rural areas of the County. Grass fires and peat fires are the two main types of wildland fires of concern in Sacramento County. Grass fires are an annual threat in the unincorporated area of the County, especially recreational areas such as the American River Parkway. Peat fires are unique to the Delta where peat is subject to spontaneous combustion. Once started, these fires become very difficult to control. Peat can still burn some distance underground even when the upper layers of peat are saturated with water over an extended period of time. Once the ground has dried out, a peat fire may return to the surface.

While the urbanized areas do not have fire hazards associated with high levels of vegetation, the intensity and type of development play a major role in the incidence of structural fires. Modern building codes adopted by Sacramento County are designed to address safety measures that minimize fires and the loss of life. High quality industrial and commercial structures pose significantly less of a fire hazard than other types of structures because they are usually supplied with fire detection systems and extinguishing devices. Petroleum tanks are now required to be built with dikes surrounding the tanks to minimize the fire hazard outside the storage area.

TABLE IV-1

NUMBER OF FIRES IN 1988 BY INCIDENT
SACRAMENTO COUNTY EXCLUDING SACRAMENTO CITY

	Number	Percent
Buildings	914	22.8%
Grass	1,393	34.8%
Vehicle	1,002	25.0%
Refuse	446	11.1%
Outside Structure	116	2.9%
Explosion	3	0.1%
Crops	7	0.2%
Mobile Home	21	0.5%
Other	102	2.5%
Unknown	3	0.1%
Total	4,007	100.0%

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Section V

EMERGENCY PREPAREDNESS
TECHNICAL DISCUSSION

The Sacramento County Office of Emergency Operations, established in 1973, is vested with the responsibility of coordinating all public and private support agencies in the event of extraordinary emergency situations associated with natural disasters and technological incidents. These agencies include law enforcement, fire and rescue, health, public works, transportation, welfare, and communications.

In addition to the role of coordination in the event of an emergency, the Office of Emergency Operations is responsible for collecting and maintaining the individual support plans relating to specific types of emergencies. Currently, three sets of plans are maintained by the Emergency Operations Center, including supporting documentation to a master preparedness plan known as the Multi-Hazard Functional Plan. The format of this document is in accordance with guidelines established by the Governor's Office of Emergency Services. Essentially, the Multi-Hazard Functional Plan consolidates all hazard-specific plans prepared by several agencies throughout the County into a single document. The State is developing the California Emergency Plan which will include an update of local area plans as part of an overall state emergency response plan.

The second set of plans is the Rancho Seco Off-site Emergency Response Plan which provides the framework for protecting members of the public and emergency response workers in the event of an emergency at the Rancho Seco Nuclear Generating Station. Since the closure of the plant in June, 1989, the nature of a potential emergency has changed considerably. The Sacramento Municipal Utility District has developed revisions to the plan to address the long term defueled condition of the plant. The main focus of the plan will be to provide for the protection of on-site personnel and the protection of the public by communication with off-site agencies. This plan differs from earlier versions in that an Emergency Planning Zone of approximately 10 miles in radius, an Emergency News Center, and an Emergency Operations Facility and Emergency Response Organization staffing for off-site support are no longer included. The plan revision has been submitted to the U.S. Nuclear Regulatory Commission for review.

The third plan, the Sacramento County Hazardous Materials Incident Response Plan, contains measures to protect the health and welfare of the population, public and private property, and natural resources (environment) from incidents

involving hazardous materials. The plan specifically outlines methods and procedures that decision makers and County regulatory and response agencies will use for managing, tracking, containing, removing, and disposing of hazardous materials that are released or threatened to be released in Sacramento County.

The ability to implement an emergency response plan can be strongly affected by land use decisions made by the County. For example, in case of an emergency, there may be a need to evacuate large numbers of people from a given area. If the road network has been poorly planned and not designed to serve population densities, it could hamper the ability of emergency response workers to move people out of the area in a timely manner. Also, if high density or other sensitive land uses are allowed to develop near facilities that could cause a major emergency situation, the evacuation of large numbers of people becomes more difficult. In terms of response to an emergency, therefore, an adequate circulation network and less intensive land uses near critical facilities becomes central to saving lives and minimizing property damage.

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